

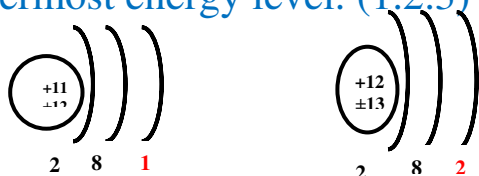


Unit (1) Chemical substance

Lesson (1) Metals and non-metals

Metals

They have less than (4) electrons in the outermost energy level. (1.2.3)



They are solids (except mercury (Hg) which is a liquid)
Mercury



They have metallic luster
Like Sodium



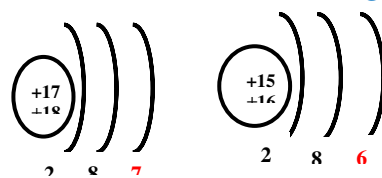
They are malleable and ductile.



They are good conductors of heat and electricity.

Non-metals

They have more than (4) electrons and less than 8 in the outermost energy level (5.6.7)



They are solids and gases (Except bromine (Br) which is a liquid).



They have no luster.
Like Carbon



They are not malleable or ductile.

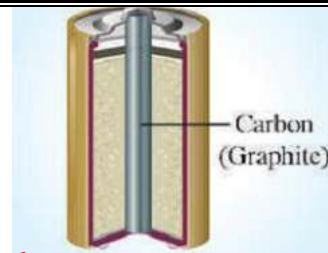


They are bad conductors of heat and electricity. (Except graphite (carbon) that is a good conductor of electricity).

Good Conductor



Bad Conductor



Dry cell

Discover The differences between the metals and the nonmetals 1-
Which is the metallic element and which is the nonmetallic element



Sodium



Carbon (Graphite)

The metallic element

The nonmetallic element

Which of the two elements has metallic luster Sodium



Which of the two elements is ductile, malleable and formable copper

أي العنصرين قابل للطرق والطرق والتشكيل

and which of them is brittle Sulphur

وأيهما هش؟

3-Construct an electrical circuit then connect the two ends (X) and (Y) by using the following substances to test their electrical conductivity

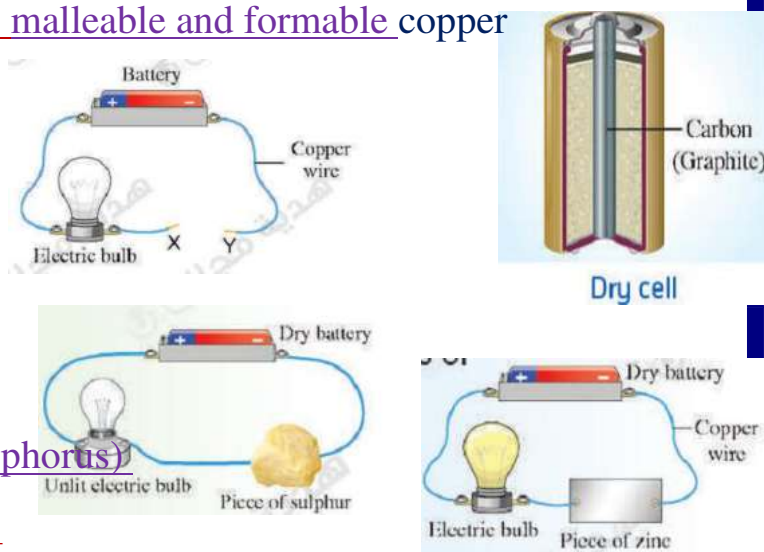
A-Sheets of (Zinc-Copper – Silver) _

Electrical conductivity

B-Pieces of (Sulphur- Graphite Phosphorus)

Electrical insulators

It is concluded from the previous that



<u>Metals</u> Sodium, copper, zinc and	<u>Non-metals</u> such as carbon and sulphur
They <u>have metallic</u> luster. Like silver	They <u>have no luster</u> . Like Carbon
They are <u>malleable</u> and <u>ductile</u> .	They are <u>not malleable</u> or <u>ductile</u>
They are thermal conductivity (conduct <u>heat</u> and <u>electricity</u>).	They are thermal insulators of <u>heat</u> and <u>electricity</u> . (Except <u>graphite</u> (carbon) that is a good conductor of <u>electricity</u>).
<u>High</u> melting points	<u>Low</u> melting points

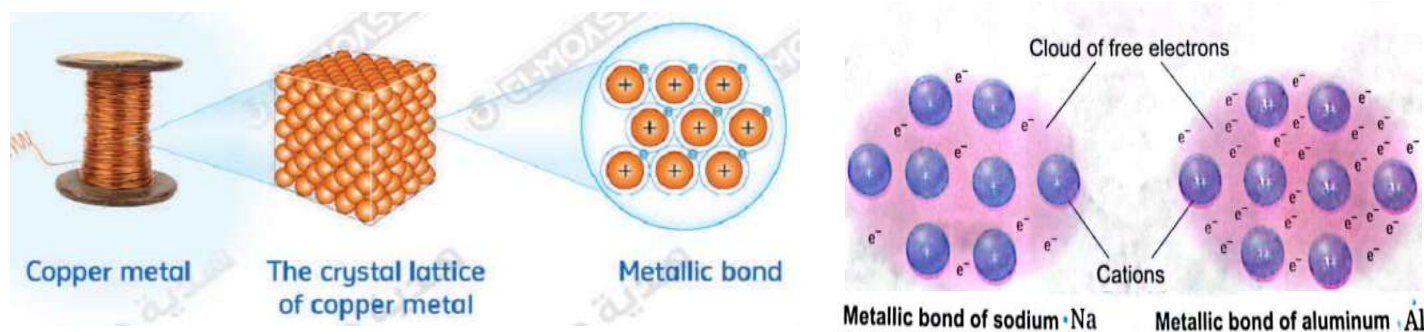
Metallic bonds

The atoms of the solid metals are gathered in an arrangement known as Metallic crystal lattice they exist in the lattice as cations (+Positive ions) surrounded by a cloud of the free-moving valence electrons

تتجمع ذرات المعادن الصلبة في ترتيب يعرف باسم الشبكة البلورية المعدنية، وتوجد في الشبكة على شكل كاتيونات (+ أيونات موجبة) محاطة بسحابة من الإلكترونات التكافؤية الحرة الحركة

Metallic bonds The attraction force between the positive metal ions and the negative valence electron cloud which surrounds them .

.. ب بين الأيونات المعدنية الموجبة وسحابة الإلكترونات السالبة التكافؤ التي تحيط بها الرابطية المعدنية قوة الجذب



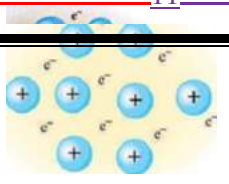
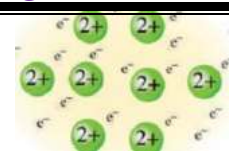
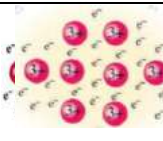
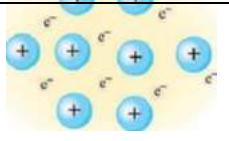
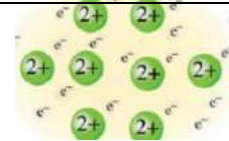
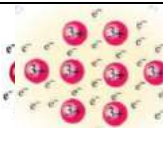
The metallic bond is responsible for the hardness of metals and the high melting point.

The more valence electrons there are in an atom, the stronger the metallic bond.

الرابطة المعدنية هي المسؤولة عن صلابة المعادن ودرجة انصهارها العالية كلما زاد عدد الإلكترونات التكافؤية في الذرة، كلما كانت الرابطة المعدنية أقوى.

Therefore, the metal is more solid and has a higher melting point.

لذلك، يكون المعدن أكثر صلابة وله درجة انصهار أعلى،

<u>Metals</u>	<u>Sodium</u> ₁₁ Na	<u>Magnesium</u> ₁₂ Mg	<u>Aluminum</u> ₁₃ Al
			
<u>metallic bond</u>			
<u>Melting point</u> .	<u>98°C</u>	<u>650°C</u>	<u>660°C</u>

.The strength of the metallic bond increases with the increase in the number of valence electrons

تزداد قوة الرابطة المعدنية مع زيادة عدد الإلكترونات التكافؤية

Pure metals are soft, almost unfit for the industrial uses,

Alloy A mixture of two or more molten metals.

السبائك * المعادن النقية لينّة، وغير صالحة للاستخدامات الصناعية تقريباً، السبيكة خليط من معدنين أو أكثر من المعادن المنصهرة.

its properties are differ from the properties of the elements forming it.

* **Bronze alloy** is one of the well known alloys used in jewellery medals and statues), it is composed of copper (95%), tin (5%)

(سبيكة البرونز هي واحدة من السبائك المعروفة المستخدمة في المجوهرات والميداليات والتماثيل، وتتكون من النحاس (95%) والقصدير (5%)

Bronze alloy is characterized by being harder than copper, and it does not rust..

تتميز سبيكة البرونز بأنها أكثر صلابة من النحاس، ولا تصدأ



Recycling The process of the conversion of the wastes into new usable

إعادة التدوير عملية تحويل النفايات إلى مواد جديدة قابلة للاستخدام

Recycling Some metals as copper, aluminum and iron are recycled for the following reasons:

إعادة التدوير يتم إعادة تدوير بعض المعادن مثل النحاس والألمنيوم والحديد للأسباب التالية:

- 1- Their percentage in the earth's crust decreases.
- 2- It is difficult to extract them from their ores.
- 3- Recycling metals is much cheaper than extracting them from their ores.

1- انخفاض نسبتها في القشرة الأرضية.

2- صعوبة استخراجها من خاماتها.

3- تكلفة إعادة تدوير المعادن أقل بكثير من تكلفة استخراجها من خاماتها.





Lesson one

1- Write the scientific term

- (1) Elements that have a metallic luster and are good conductors of heat and electricity. ()
- (2) Brittle elements that are not malleable or ductile, or formable. ()
- (3) A non-metallic element that is a good conductor of electricity. ()
- (4) The attraction force between positive metal ions and the negative valence electrons which surrounding them. ()
- (5) A mixture consisting of the melt of two metals or more. ()
- (6) The process of converting waste into new materials suitable for use. ()

2. Choose the correct answer:

(1) Each of the following represents the element sodium, except:

- a. metal b. has metallic luster c. Bad electricity conductor d. Formable

(2) Which of the following indicates the correct order of hardness of the metals sodium $_{11}\text{Na}$, magnesium $_{12}\text{Mg}$, and aluminum $_{13}\text{Al}$?

- a. $\text{Na} > \text{Mg} > \text{Al}$ b. $\text{Al} > \text{Mg} > \text{Na}$ c. $\text{Mg} > \text{Na} < \text{Al}$ d. $\text{Al} > \text{Na} > \text{Mg}$

(3) Element (X) has a boiling point of 2807°C and a melting point of 1064°C .

Which of the following is a property of element (X)?

- a. Bad conductivity of electricity b. brittle c. Ductile d. Opaque

(4) Which of the following questions helps in classifying some elements into metals and non-metals?

- a. Is it solid? b. Is it liquid? c. Is it colorful? d. Is it brittle?

(5) What is the common property between sodium and copper?

- a. The color. B. Density. C. melting point. D. Physical condition.

(6) The last energy level of metal atoms contains .

- a. 1:3 electrons B. 3:5 electrons.. C. 5:7 electrons. D. 8 electrons.

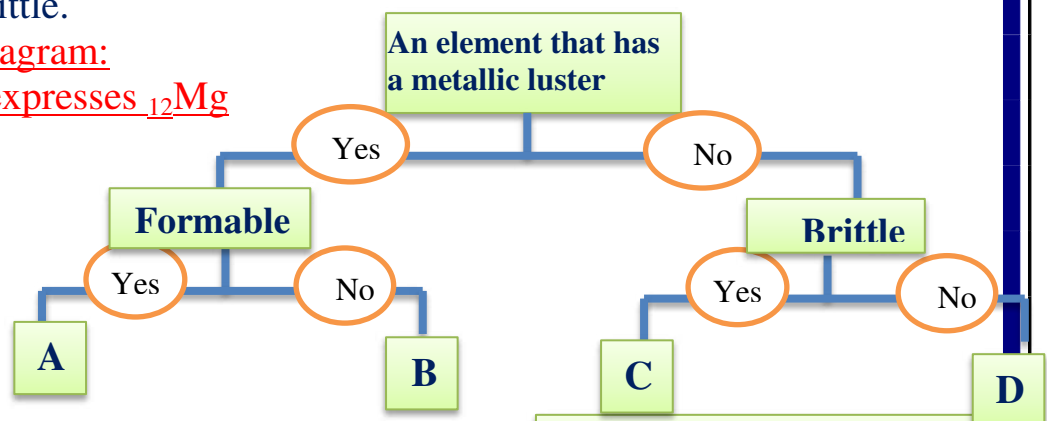
(7) Which of the following represents the pure element silver?

- a. Soft, heat conductive, opaque.
b. Conducts, a heat conductor, has a metallic luster. brittle
c. Conducts heat, has a metallic luster
d. Conductive, opaque, brittle.

(8) From the opposite diagram:

Which of the following expresses $_{12}\text{Mg}$

- a. A. B. B
c. C. d. D

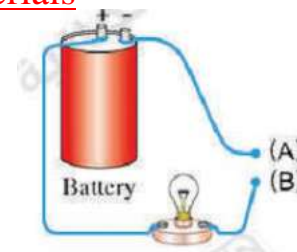


(9) The liquid element that is a bad conductor of heat and electricity is...

- a. bromine b. Chlorine c. Mercury d. Lithium

(10) In the opposite electrical circuit: Which of the following materials, when connected to points (A) and (B), will light up the bulb?

- a. Graphite and sulfur. b. Sulfur and copper.
c. Graphite and aluminum. d. Graphite and bromine.



(11) The metallic bond exists between

- a. Atoms of two different metals. b. Atoms of the same metal
c. Positive ions and negative ions. d. Metal atoms and hydrogen.

(12) The strength of the metallic bond increases with the increase in the number.

- a) Nuclear protons. B) valence electrons.
c) Energy levels b) neutrons of the nucleus.

(13) Which of the following elements is the hardest?

- a. $_{13}\text{Al}$ b. $_{17}\text{Cl}$ c. $_{12}\text{Mg}$ d. $_{11}\text{Na}$

(14) Copper is an element that enters into the composition of the bronze alloy, at a rate of

- a. 5% b. 15% c. 65% d. 95%

(15) Which of the following represents a metal that is not preferable to be recycled?

	Its presence in the Earth's crust	Ease of extraction from its ores	The cost of recycling it
a	High	Easy	Medium
b	Low	Difficult	High
c	Low	Difficult	Low
d	Medium	Difficult	High

3- Choose from column (B) what matches column (A), and rewrite the complete sentences:

(A)	(B)
(1) Carbon	(1) It enters into the composition of bronze alloy in a small proportion.
(2) Mercury	(2) A liquid element that is a poor conductor of heat.
(3) Tin	(3) A brittle metal that does not conduct electricity.
(4) Sulfur	(4) A brittle non-metal that is a good conductor of electricity.
	(5) A liquid element with a metallic luster.

4-Complete the following sentences with the appropriate word

- (1) The outer energy level of atoms of most non-metallic elements contains more than electron and less than electron
(2) The..... elements are bad conductor of heat and electricity exceptwhich is good conductor of electricity.
(3)..... elements characterized by their malleable, ductile and formable, while is brittle, not malleable, ductile, or formable.
(4) Bythe number of valence electrons in a metal atom, the strength of its Metallic bond will.....

(5) Bronze alloy is made by adding ametal tometal

5-Put (✓) and (X) and correct the wrong

(1) Lithium and sulfur can be distinguished by electrical conductivity. ()

(2) Sodium is a soft metal with a lower melting point than non-metals. ()

(3) Sulfur is used in the manufacture of dry column. ()

(4) Bromine is a liquid element with a metallic luster. ()

(5) Magnesium is harder than sodium, because magnesium has fewer valence electrons than sodium. ()

(6) The hardness of the metal and its high melting point are due to the fact that its atoms are linked together by ionic bonds. ()

(7) Pure gold metal is harder than gold alloys. ()

6-Give reasons for the following:

(1) Magnesium $_{12}\text{Mg}$ is a metallic element, while sulfur $_{16}\text{S}$ is a nonmetallic element.

(2) Graphite is used in the manufacture of dry columns, although it is a non-metal.

(3) A piece of sulfur crumbles easily when struck, while it is difficult to crumble a piece of iron.

(4) Aluminum $_{13}\text{Al}$ is harder and has a higher melting point than sodium $_{11}\text{Na}$.

(5) It is preferable to use alloys in industry instead of pure metals.

(6) Bronze alloy is used in the manufacture of jewelry and statues instead of copper metal.

(7) Recycling some metals.

7-What happens when:

(1) a piece of sulfur is hammered .

(2) Increasing the number of valence electrons in metal atoms (their melting points.)

(3) Adding a molten metal to a another metal melt

8-cross out the odd word, what connects the rest of the words

(1) Magnesium / Copper / Mercury / Silver.

(2) Lithium / Sodium / Calcium / Carbon.

(3) Aluminum/Nitrogen/Hydrogen/Iodine.

(4) Graphite / Sulfur / Chlorine / Oxygen



Lesson (2) Acids and Alkalis



Atomic group المجموعة الذرية

An ion that consists of more than one atom of more than one element is known as of the polyatomic ion or atomic group.

الأيون الذي يتكون من أكثر من ذرة واحدة من أكثر من عنصر واحد يُعرف باسم الأيون المتعدد الذرات أو المجموعة الذرية.

Atomic group المجموعة الذرية

An ion composed of more than one atom of more than one element.

أيون يتكون من أكثر من ذرة واحدة من أكثر من عنصر واحد.

An atomic group carries a number of positive or negative charges.

تحمل المجموعة الذرية عدداً من الشحنات الموجبة أو السالبة.

Cations (positive ions) (Metallic element ions)

Lithium.....	Li ⁺
Sodium.....	Na ⁺
Potassium.....	K ⁺
Silver.....	Ag ⁺
Magnesium.....	Mg ²⁺
Calcium.....	Ca ²⁺
Zinc.....	Zn ²⁺
Barium.....	Ba ²⁺
Aluminum.....	Al ³⁺

Anions (negative ions) (Nonmetallic element ions)

Fluoride.....	F ⁻
Chloride.....	Cl ⁻
Bromide.....	Br ⁻
Iodide.....	I ⁻
Oxide.....	O ²⁻
Sulphide.....	S ²⁻



Atomic group	valency	Atomic group	valency	Atomic group	valency
Hydroxide (OH) ⁻	Monovalent	Carbonate (CO ₃) ⁻²	Divalent	Phosphate (PO ₄) ⁻³	Trivalent
Nitrate (NO ₃) ⁻		Sulphate (SO ₄) ⁻²			
Nitrite (NO ₂) ⁻		Sulphite (SO ₃) ⁻²			
Chlorite (ClO ₂) ⁺					
Bicarbonate (HCO ₃) ⁻					
Ammonium (NH ₄) ⁺					

Acids The name of the acid is related to the name of anion that is part of its composition.

Whether it is: 1-Anion of a non-metallic element (except oxygen).

Acids whose atomic group contains oxygen are called oxygenated acids.

2-Anion of one of the negative atomic groups Except for the hydroxide group.

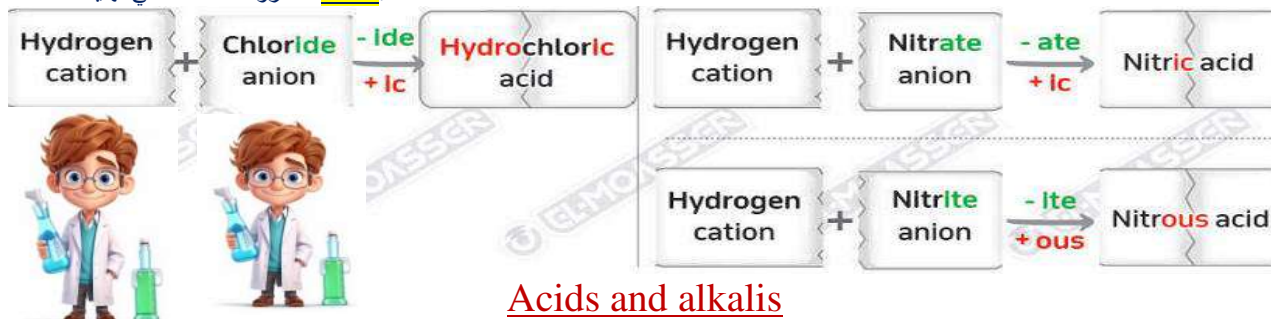
Mineral acids are classified into:

	A) Non –oxygenated acids Acids do not contain oxygen	B) Oxy-acids (Acids that contain oxygen)
<u>Defination</u>	The name begins with a word composed of the prefix "hydro", then the name of the anion, followed by the word "acid" يبدأ الاسم بكلمة مكونة من البادئة "هيدرو"، ثم اسم الأنيون، متبوعاً بكلمة "حمض"	The name begins with the name of the anion (The negatively charged atomic group), followed by the word "acid" يبدأ الاسم باسم الأنيون (المجموعة الذرية المشحونة سلبيًا)، متبوعاً بكلمة "حمض"
<u>Examples :</u>	* Replacing the suffix (-ide) of the anion with the suffix (-ic) in the acid. استبدال النهاية (-ide) . للأنيون بالنهاية (-ic) في الحمض	* Replacing the suffix (-ate) of the anion with the suffix (-ic) in the acid * Replacing the suffix (-ite) of the anion with the suffix (-ous) in the acid.

* Prefix: Letters added at the beginning of a word * البادئة: الحروف المضافة في بداية الكلمة

* **Suffix:** Letters added at the end of a word.

اللاحقة: الحروف المضافة في نهاية الكلمة *



Acids and alkalis

Acids

Substances that dissolve in water and give positive Hydrogen ions H^+



Alkalis

Substances that dissolve in water and give negative Hydroxyl ions OH^-

Molecular formulas of acids and alkalis الصيغ الجزيئية للأحماض والقلويات

Writing molecular formulas for acids

The molecular formula of the acid begins with the symbol of hydrogen cation H^+ , the name of the acid is related to the name of the **anion** which composes it,

يرتبط اسم الحمض باسم الأنيون الذي يتكون منه، H^+ تبدأ الصيغة الجزيئية للحمض برمز كاتيون الهيدروجين

The anion symbol of the element or the anion formula of the atomic group.

Non-oxygenated acids The following acids don't contain oxygen element
الأحماض غير المؤكسدة لا تحتوي الأحماض التالية على عنصر الأكسجين



Formula of acid molecule	Anion	The name of compound in gaseous state	The name of compound in solution form
HCl	Chloride (Cl^-)	Hydrogen Chloride	Hydrochloric acid
HBr	Bromide (Br^-)	Hydrogen Bromide	Hydrobromic acid
H ₂ S	Sulphide (S^{2-})	Hydrogen Sulphide	Hydrosulphic acid

What is the suffix (letters added to the end of each of the anion and the acid composed from it?)

ما هي اللاحقة (الحروف المضافة إلى نهاية كل من الأنيون والحمض المكون منه؟)

oxygenated acids The following acids contain oxygen element
الأحماض الأكسجينية تحتوي الأحماض التالية على عنصر الأكسجين



Anions ending
with the suffix

(ate)

Acids of these anions
have the suffix

(ic)

Nitrate



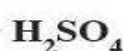
Nitric acid



Sulphate



Sulphuric acid



Phosphate



Phosphoric acid

Anions ending
with the suffix

(ite)

Acids of these anions
have the suffix

(ous)

Nitrite



Nitrous acid



Sulphite



Sulphurous acid



The importance of acids in our lives

1- حمض الهيدروكلوريك :- حمض تفرزه المعدة -

1- hydrochloric acid :- Acid secreted by the stomach.

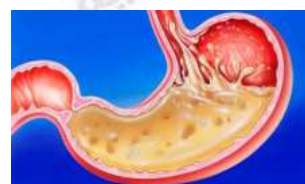
It contributes to the digestion of food.

يساهم في هضم الطعام .

2- Lactic acid حمض اللاكتيك

Acid provides the muscles with the necessary energy when oxygen is lacking, but its accumulation in the muscles.

يمد الحمض العضلات بالطاقة اللازمة عند نقص الأكسجين ولكن تراكمه في العضلات



Alkali

Writing molecular formulas for alkali

The molecular formula of the alkali ends with the formula of hydroxide anion OH^- , and the name of the alkali is related to the name of the cation which composes it.



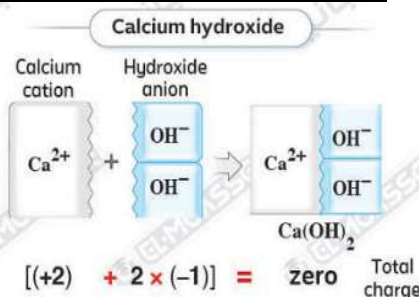
، ويرتبط اسم القلوي باسم الكاتيون الذي يتكون منه OH^- تنتهي الصيغة الجزيئية للقلويات بصيغة أنيون الهيدروكسيد

Cation	Formula of alkali molecule	name of alkali
Sodium (Na^+)	Na OH	Sodium <u>hydroxide</u>
Magnesium (Mg^{+}).	Mg (OH)_2	Magnesium <u>hydroxide</u>
Ammonium (NH_4^+)	$\text{NH}_4 \text{OH}$	Ammonium <u>hydroxide</u>

- It is clear from the previous that:

The acids which do not contain oxygen element end with the word acid preceded by a section with the prefix (letters added at the beginning) Hydro followed by the name of the anion with replacing the suffix (-ide) with the suffix (-ic).

الأحماض التي لا تحتوي على عنصر الأكسجين تنتهي بكلمة حمض مسبقة بقسم بالبادئة (الحروف (-ic) باللاحقة (-ide) المضافة في البداية) هيدرو متبوعة باسم الأنيون مع استبدال اللاحقة



The acids which contain oxygen element (oxyacids) whose anion suffix is:

(-ate): Ends with the word acid, preceded by the name of the anion with replacing the suffix (-ale) with the suffix (-ic)

الأحماض التي تحتوي على عنصر الأكسجين (الأحماض الأكسجينية) التي تكون لاحقة الأنيون الخاصة بها:

(-ate): تنتهي بكلمة حمض مسبقة باسم الأنيون مع استبدال

(-ic) باللاحقة (-ate) باللاحقة

(-ite): Ends with the word acid, preceded by the name of the anion with replacing the suffix (-ite) with the suffix (-ous).

(-ite): تنتهي بكلمة حمض مسبقة باسم الأنيون مع استبدال

(-ous) باللاحقة (-ite) باللاحقة

-Number of hydrogen atoms in the acid molecule equals the magnitude of the charge of its anion.

عدد ذرات الهيدروجين في جزيء الحمض يساوي مقدار شحنة أنيونه.

-Number of hydroxide groups in the alkali molecule equals the magnitude of the charge of its cation.

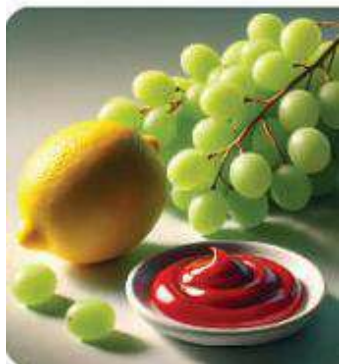
عدد مجموعات الهيدروكسيد في جزيء القلوي يساوي مقدار شحنة كاتيونه.

-The total charge of a molecule of any compound is equal to zero

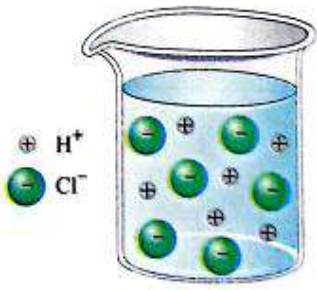
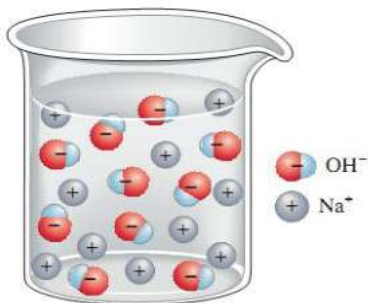
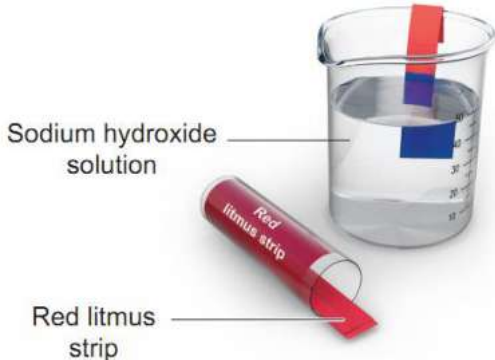
الشحنة الكلية لجزيء أي مركب تساوي صفراً.

Write the formula and the name of the acid which contains the following anions:

<u>Cation</u>	<u>Acid Formula</u>	<u>name of acid</u>
(1) <u>iodide</u> I:	HI	Hydroiodic acid
(2) <u>Carbonate</u> CO_3^{2-}	H_2CO_3	Carbonic acid
(3) <u>Chlorite</u> ClO_3^-	HClO_3	Chlorous acid



Properties of acids and alkalis

	<u>Acids</u>	<u>Alkalies</u>
<u>example</u>	, lemon, ketchup and grapes	cleaners, toothpaste and baking soda
	They are substances which dissociate in water increasing <u>hydrogen ions (H^+)</u>	They are substances which dissociate in water increasing <u>hydroxide ions (OH^-)</u> .
		
	When hydrogen chloride gas HCl dissolves in water H^+ cations and Cl^- anions are formed.	When sodium hydroxide $NaOH$ dissolves in water Na^+ cations and OH^- anions are formed.
<u>distinguish between acidic and alkaline</u>	When sulfuric acid H_2SO_4 dissolves in water, <u>H^+ cations</u> and SO_4^{2-} anions are formed.	When magnesium hydroxide $Mg(OH)_2$ dissolves in water, Mg^{+2} cations and <u>OH^- anions</u> are formed.
	Turns the blue litmus blue paper red.	Turns the blue litmus red paper blue.
		

Any solutions of the following materials: $NaOH$ - HCl - $NaCl$ - HNO_3 . $Ca(OH)_2$ (1) Change the blue litmus paper to red.(2) Change the red litmus paper to blue.

Strong Acids

Acids are good conductors of electricity.

Ex Hydrochloric acid

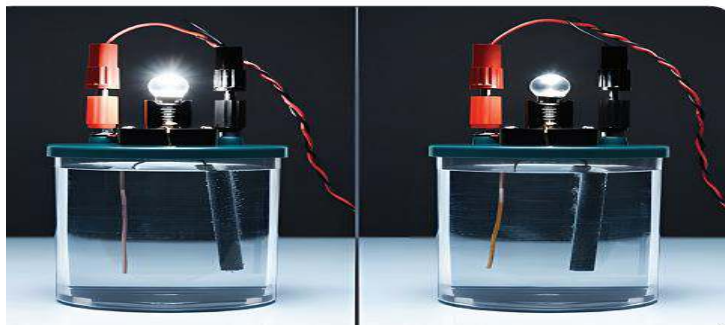
.. Nitric acid. Sulfurous acid

Weak Acids

Acids are poor conductors of electricity.

Ex Vinegar (diluted acetic acid.

Nitrous acid - Sulfuric acid



The electrical conductivity of sodium hydroxide is stronger than that of ammonium hydroxide.

التوصيل الكهربائي لهيدروكسيد الصوديوم أقوى من هيدروكسيد الأمونيوم.

Because sodium hydroxide is a strong alkali, - ammonium hydroxide is a weak alkali.

هيدروكسيد الأمونيوم قلوي ضعيف- لأن هيدروكسيد الصوديوم قلوي قوي،

Reaction of acids with alkalis (Acids + Alkali → Salt + water)

Acids do not react with each other, and alkalis do not react with each other.

Medical application الاستخدامات الطبية

Milk of magnesia is used as a temporary remedy to neutralize stomach acidity.

يستخدم حليب المغنيسيا كعلاج مؤقت لتحييد حموضة المعدة.

Because it contains magnesium hydroxide $Mg(OH)_2$

$Mg(OH)_2$ لأنه يحتوي على هيدروكسيد المغنيسيوم

Metal and nonmetal oxides When a metal or non-metallic element burns in the presence of oxygen, a compound known as an oxide is formed.

أكاسيد الفلزات واللافلزات. عندما يحترق عنصر معدني أو غير معدني في وجود الأكسجين، يتكون مركب يعرف بالأكسيد

Metal oxides

Oxides produced by the combustion of metals in the presence of oxygen.

Most of them are known as basic oxides.

Basic oxides, some of which dissolve in water to form alkalis.

Combustion of magnesium

Magnesium burns to form magnesium oxide (MgO)

Which dissolves in water to form a solution of magnesium hydroxide

$Mg(OH)_2$

which turns the red litmus stripe to blue

Non-Metal oxides

Oxides produced by the combustion of non-metals in the presence of oxygen.

Acidic oxides Most of them are known as acidic oxides.

Sulfur combustion

Sulfur burns to form sulfur trioxide, SO_3 which dissolves in water to form a sulfuric acid solution, H_2SO_4 which turns the blue litmus stripe to red.



Magnesium burning



Sulphur burning

Take care

Metal oxides react with acids but do not react with alkalis.

تتفاعل أكاسيد المعادن مع الأحماض ولكنها لا تتفاعل مع القلويات.

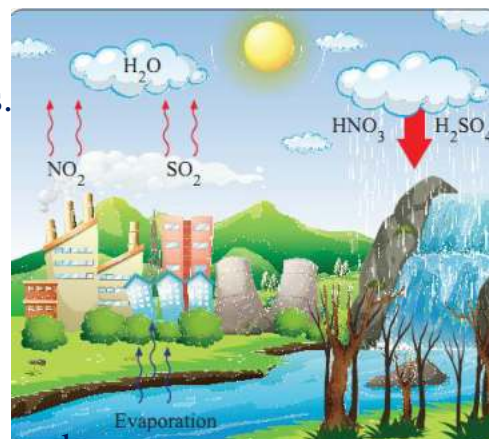
Non-metal oxides react with alkalis but not with acids.

تتفاعل الأكاسيد غير المعدنية مع القلويات ولكنها لا تتفاعل مع الأحماض.

Acid rain.المطر الحمضي

The combustion of fossil fuels (as petroleum, diesel, cars, power plants and factories produces acidic oxides such as nitrous oxide, NO_2 - sulfur dioxide SO_2 , carbon dioxide, nitrogen and sulfur in the seas of fresh air and collected in the reefs.

ينتج عن احتراق الوقود الحفري (مثل البترول والديزل والسيارات ومحطات الطاقة والمصانع) أكاسيد حمضية مثل أكسيد النيتروز وثاني أكسيد الكبريت وثاني أكسيد الكربون والنيتروجين والكبريت في البحار والهواء النقي وتجمع في الشعاب المرجانية.



Acid rain resulting from the dissolution of acidic oxides in the water vapor of the atmosphere

المطر الحمضي الناتج عن إذابة الأكاسيد الحمضية في بخار الماء في الغلاف الجوي

Acid rain damage

1. Destruction of forests
2. Harming to aquatic organisms living in the financial surfaces.
- 3 It decompose the stones of buildings
- 4-Human respiratory health problems.

أضرار الأمطار الحمضية

1. تدمير الغابات
2. الإضرار بالكائنات المائية التي تعيش في الأسطح المائية.
- 3- تحلل أحجار المباني
- 4- مشاكل صحية في الجهاز التنفسي للإنسان



Lesson two1-Write the scientific term (or name)Molecular epilepsy of acids and their importance

- (1) An ion composed of more than one atom of an element ()
- (2) A scientist explained that alkalis are substances that dissolve in water and give (produce) hydroxide ions. ()
- (3) Acids produced from combination of hydrogen with one of the negatively charged atomic groups, except the hydroxide group. ()
- (4) An acid secreted by the stomach that participates to the digestion of food.()
- (5) An acid formed in the muscles when there is a lack of oxygen , causing muscle cramp. ()

Properties of acids and bases

- (6) A substance whose dissolution in water lead to increases the percentage of H^+ cations in the solution. ()
- (7) A substance whose dissolution in water lead to increases the percentage of OH^- cations in the solution. ()
- (8) Acids that are good electrical conductors. ()
- (9) Metal oxides, some of which dissolve in water, forming alkalis. ()
- (10) Nonmetal oxides dissolve in water, forming acids. ()
- (11) Rains which result from the dissolution of acidic oxides in the atmospheric of water vapor. ()

2.Choose the correct answer:Molecular dyeing of acids and their importance

- (1) All of the following molecular formulas for ions are correct. except
- a. Sulfate SO_4^{2-} b. Phosphate PO_4^{3-} c. Hydride OH^- d. Nitrite NO_2^-
- (2) Which of the following represents the sulfite and methanol ions, respectively?
- a. SO_2^- , NO_2^- b. SO_3^{2-} , NO_2^- c. SO_3^{2-} , NO_3^- d. SO_2^- , NO_3^-
- (3) Element enters in the formation of all the negative atomic groups that you studied.
- a. Hydrogen element. b. Oxygen element c. Nitrogen element d. Sulfur element
- (4) The carbonate and sulfate group are similar in.
- a. Charge and number of elements only.
- b. Charge and number of atoms only.
- c. Number of elements and number of atoms only.
- a. Charge , number of elements and Number of atoms.
- (5) Molecular formula of hydrochloric acid
- a. HCl b. HClO c. $HClO_2$ d. $HClO_3$
- (6) The correct name for H_2SO_3 is
- a. Sulfuric acid. b. Hypochloric acid c. Sulforous acid d. Hypochlorous acid
- (7) Which of the following expresses the correct formula for oxygenated acid?
- a. H_2O_3S b. H_2S c. H_2SO_3 d. $SO_3 H$

(8) Acids contain the following atomic groups, except...

- a. Carbonate group. b. Sulfate group c. Nitrate group d. Hydroxide group

(9) Each of the following expresses the compound H_2S , except...

- a. It is known as hydrogen sulfide and is in the gaseous state.
b. It is known as hydrosulfuric acid and is in solution form.
c. The cation in it carries two positive charges.
d. The anion in it carries two negative charges.

Properties of acids and alkalis

(10) Which of the following substances is considered an acid?

- a. Lemon and baking soda. b. Ketchup and grapes.
c. Soap and toothpaste d. Detergents and ketchup.

(11) The ion responsible for acidic properties is

- a. NH^+ b. O^{2-} c. H^+ d. OH^-

(12) Each of the following represents a solution of HI acid, except...

- a. A gas dissolved in water. b. it turn blue litmus strip to red
c. it reacts with HCl acid d. it contain H^+ ions

(13) It results from dissolving sulfuric acid H50 in water.

- a. cations H^+ and SO_3^{2-} anions a. cations H^+ and $\text{S}_2\text{O}_3^{2-}$ anions
c. cations H^+ and S^{2-} anions d. cations H^+ and SO_4^{2-} anions

(14) The alkali fluid that is poured into clogged drains to unclog them is likely to be

- a. HCl b. H_2O c. NaCl d. NaOH

(15) All of the following acids are strong, except:

- a. Nitric acid. b. Acetic acid. c. Sulfuric acid. d. Hydrochloric acid.

(16) All of the following are poor conductors of electricity, except...

- a. Ammonium hydroxide b. Sulfurous acid
c. Sodium hydroxide d. Nitrous acid

(17) The compound which is used in antacids is..

- a. MgCl_2 b. $\text{Mg}(\text{OH})_2$ c. H_2SO_3 d. NaCl

(18) Among the basic oxides is.

- a. SO_2 b. SO_3 c. NO_2 d. Na_2O

(19) All of the following are properties of alkalis, except:

- a. They contain OH^- ions
b. They turn red litmus paper to blue
c. They can react with sodium hydroxide solution.
d. They can react with hydrochloric acid solution.

(20) When HCl acid reacts with NaOH, a salt is formed.

- a. NaCl b. H_2O c. Na_2O d. NaCl

(21) Oxides resulting from the combustion of fossil fuels.

- a. SO_3 , N_2O b. MgO , CaO c. NO_2 , SO_2 d. Na_2O , SO_2

(22) Which of the following are harmful effects of acid rain, except:

- a. Destruction of forests. b. Destruction of the human digestive system.



c. corrosion building. d. Destruction of aquatic organisms.

3-Write the Names of the following acids and alkalis:

a. H_2CO_3 b. HF c. LiOH d. $\text{Mg}(\text{OH})_2$

4-Write the chemical formula for each of the following..

(1) Sulfuric acid. (2) Sodium hydroxide.

5-Complete the following sentences

Molecular formula of acids and their importance

- (1) group..... positive charge, while group its Charge $^{-3}$.
- (2) The molecular formula of acids begins with the symbol..... cation. While the molecular formula of alkaloids ends with ananion
- (3) The hydrogen cation combines with the sulfur anion, sulfite, to form an acid known as And its molecular formula.....
- (4) Compound HI is known in the gaseous state as..... It is in the form of a solution with the name.....
- (5) Hydrobromic acid is formed fromcation andanion .

Properties of acids and alkalis

- 6-Lemon is considered fromwhile Grease cleaner from
- 7-When acids dissolves of acids in water, the percentage ofcations increases. , while during alkali dissolves in water the percentage ofanions increases
- (8) The gasdissolves in water formingcations which are responsible for the properties of acids and Cl^- anions.
- (9)is a strong alkali, whileis a weak acid.
- (10) Oxides are divided intooxides and..... oxides
- (11)burns forming SO_3 , which dissolves in water to formsolution.
- (12) The dissolution ofoxides in water forms acids, while the dissolution ofoxides in water forms alkalis.
- (13) Metal oxides can react withbut they do not react with.....
- (14) When an acid reacts with an alkali,andare produced.

6- Mark (✓) or (x) for each statement, with correction:

Molecular formulas of acids and their importance

- (1) All nonmetallic element ions end with the suffix (- ate). ()
- (2) The bicarbonate and nitrate groups are similar in the number of atoms and the charge. ()
- (3) The symbol of aluminum cation is Al^{3+} , while the formula of ammonium group is NH_4^{3-} ()
- (4) The acid which contains chlorite anion ClO_2 is known as chloric acid ()
- (5) The molecular formula of nitric acid is HNO_3 , while the molecular formula of sulphuric acid is H_2S ()
- (6) The stomach secretes lactic acid which participates in the food digestion.

Properties of acids and alkalis

- (7) When lithium hydroxide dissolves in water, the percentage of OH⁻ cations in the solution increases. ()
- (8) S²⁻ anions in H₂S acid solution are responsible for its acidic properties. ()
- (9) Acids and alkalis conduct electric current to variant degrees depending on their strength. ()
- (10) Milk of magnesia contains MgO ()
- (11) NO₂ is an acidic oxide, while SO₂ is a basic oxide. ()
- (12) When calcium oxide dissolves in water and two litmus strips are placed in the solution, one of them turns purple. ()
- (13) Sulphur oxides dissolve in atmospheric water vapour, forming basic rains that cause the corrosion of buildings ()

7- Give one example for each of the following:

- (1) An atomic group with a charge of -1
- (2) An atomic group with a charge of -2
- (3) A negatively charged atomic group.
- (4) An oxyacid.
- (5) A strong acid.
- (6) A weak acid.
- (7) A strong alkali.
- (8) A weak alkali.

8- Write the chemical formula for each of the following:

- | | |
|--------------------------|-----------------------|
| (1) Hydrobromic acid. | (2) Nitric acid. |
| (3) Hydrosulphuric acid. | (4) Carbonic acid. |
| (5) Lithium hydroxide. | (6) Sodium hydroxide. |

9- Write the name for each of the following acids and alkalis:

- | | | |
|---------|-------------------------|------------------------------------|
| (1) HBr | (2) HCl | (3) H ₂ SO ₄ |
| (4) HI | (5) Mg(OH) ₂ | (6) NH ₄ OH |

10-Give reasons for each of the following:

- (1) The total charge of the molecule of any compound equals zero.
.....
- (2) The molecular formula of magnesium hydroxide includes two hydroxide groups.
.....
- (3) The stomach secretes hydrochloric acid during eating food.
.....

Properties of acids and alkalis

- (4) Acids turn blue litmus strip to red.
.....
- (5) It is possible to distinguish between acids and alkalis by using litmus strips.

.....
(6) Hydrochloric acid is a strong acid, while acetic acid is a weak acid.

.....
(7) Sodium hydroxide can be differentiated from ammonium hydroxide by using the electrical conductivity.

.....
(8) Milk of magnesia is used as a temporary treatment for gastric acidity.

.....
(9) The dangers of burning fossil fuels in cars, factories and power plants (stations).

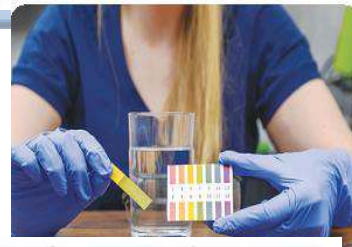
.....
(10) Acidic oxides are extremely harmful to human health.

.....
(11) Acid rains have severe harmful impacts on human and the environment in general
.....





Lesson (3) Chemical Indicators and salts



1-Chemical Indicators الادلة الكيميائية

On Adding concentrated sulphuric acid to the table sugar causes it to be charred (burn) This indicates that it is dangerous
إن إضافة حمض الكبريتيك المركز إلى سكر المائدة يؤدي إلى احتراقه (يتحول إلى اللون الأسود وهذا يدل على خطورته)



G.R. completely forbidden to taste, smell or touch any chemical substance in laboratory? يمنع منعاً باتاً تذوق أو شم أو لمس أي مادة كيميائية في المختبر

Because some acids are burning and some alkalis are caustic.
لأن بعض الأحماض حارقة وبعض القلويات كاوية

We cannot identify chemicals like acids and alkalis solutions by tasting or smelling.
لا نستطيع التعرف على المواد الكيميائية مثل المحاليل الحمضية والقلوية بالتذوق أو الشم

How can we differentiate between acidic substances, alkaline substances and neutral substances?

كيف نستطيع التفريق بين المواد الحمضية والمواد القلوية والمواد المحايدة؟

Indicators Chemicals whose color changes in an acidic medium from its color in an alkaline medium.

المؤشرات المواد الكيميائية التي يتغير لونها في وسط حمضي عن لونها في وسط قلوي

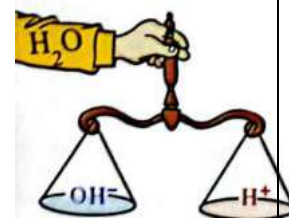
Examples of chemical Indicators أمثلة على المؤشرات الكيميائية: 1-

1 - Litmus indicators دليل عباد الشمس:

Litmus indicators used in the composition of Litmus strips that its color change according the type of medium

تدخل صبغة ورق عباد الشمس في تركيب شرائط ورق عباد الشمس حيث يتغير لونها حسب نوع الوسط

<u>Acidic medium</u>	<u>Alkaline medium</u>	<u>Neutral medium</u>
The blue color strip changes to Red color By effect <u>H^+ cations</u>	The red color strip changes to blue By effect <u>OH^- anions</u>	The red and blue strips color doesn't changes Because the number of <u>H^+ cations</u> = the number <u>OH^- anions</u>



Activity 1 Practical

Used substances:

Strong acid such as hydrochloric acid. - Weak acid such as acetic acid.

Strong alkali such as sodium hydroxide solution. Distilled water.

- Blue and red litmus strips.



<u>Strong Acidic</u>	<u>weak Acidic</u>	<u>Strong Alkali</u>	<u>Neutral substance</u>
Like Hydrochloric acid.	Like Acetic acid	Like Sodium hydroxide	Like Distilled water
			
The <u>blue</u> strip changes to <u>red</u> .		The <u>red</u> strip changes to <u>blue</u> .	The <u>blue</u> or <u>red</u> strip doesn't change color

G.R. Why are litmus strips not used to differentiate between a strong acid and a weak acid? Because they give the same color.

1 - Universal Indicators: One of the most popular chemical indicators, it is available in the form of dye (solution) or strips.

دليل اليونيفرسال أحد المؤشرات الكيميائية الأكثر شيوعاً، وهو متوفر على شكل صبغة (محلول) أو شرائط

Universal Indicators An Indicators that can differentiate between acids and alkalis, or acids and some, or alkalis and some, according to their strength.



دليل اليونيفرسال مؤشرات يمكنها التمييز بين الأحماض والقلويات، أو الأحماض وبعضها، أو القلويات وبعضها، وفقاً لقوتها

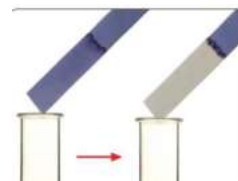
Testing the acidity and the basicity of the gases اختبار الحموضة والقاعدية للغازات

The indicator strips must be wet with water during testing the acidic, Basic and Neutral gases

يجب أن تكون شرائط المؤشرات مبللة بالماء أثناء اختبار الغازات الحمضية والقاعدية والمتعادلة

where the indicators act only in aqueous medium.

تعمل المؤشرات في الوسط المائي فقط



<u>Acidic gases</u>	<u>Basic gases</u>	<u>Gases elements</u>
carbon dioxide gas CO_2	like ammonia gas NH_3	Hydrogen H_2 - Nitrogen N_2 Oxygen O_2
changes <u>blue</u> color strip to <u>Red</u>	changes <u>Red</u> color strip to <u>blue</u>	doesn't changes litmus strips color

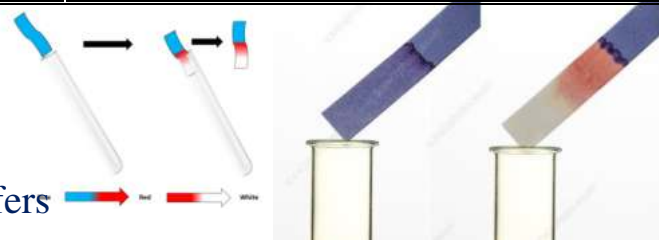
Except chlorine gas Cl_2 which removes the color of the two litmus strips

Integration with Agriculture Sciences

التكامل مع علوم الزراعة

The color of the flowers of Hydrangea plant differs according to the type of the soil

يختلف لون أزهار نبات الكوبية (الهدرانجيا) حسب نوع التربة



the flowers acquire red colorthe flowers acquire blue colorWhere when they grow in basic soil,Where they grow in acidic soil.

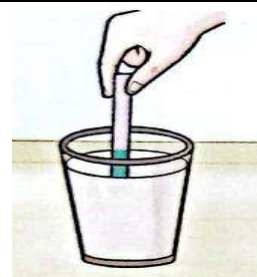
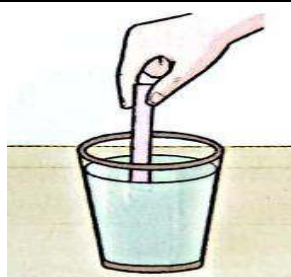
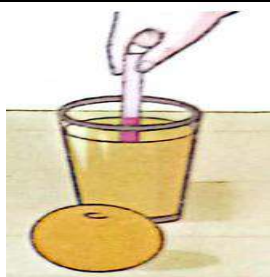
Acidic soil is treated by adding basic substances to it, such as calcium hydroxide Ca(OH)_2

Ca(OH)_2 يتم معالجة التربة الحمضية بإضافة مواد قاعدية إليها مثل هيدروكسيد الكالسيوم

The colors of most of the chemical indicators are changed by changing the type of the used solution

ألوان أغلب المؤشرات الكيميائية تتغير بتغيير نوع المحلول المستخدم

The color Cabbage plant indicator strip in

orange juiceWaterBaking soda solutionThe color strip changes to RedThe color strip doesn't changesThe color strip changes greenish

Acidity of tomatoes differs from that of lemon, So how can the acidity be accurately identified?

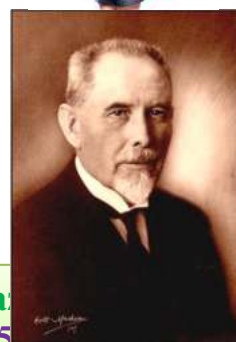
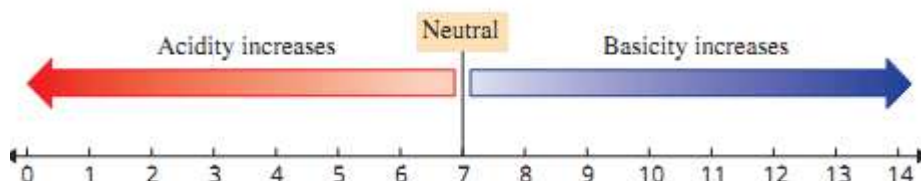
Potential of Hydrogen pH

The acidity or basicity of solutions is determined by a numerical value, using a graduated scale known as the pH, symbolized by the symbol pH.

يتم تحديد حموضة أو قاعدية المحاليل بقيمة عددية، باستخدام مقياس متدرج يُعرف باسم الرقم الهيدروجيني، ويرمز له بالرمز pH.

Potential of Hydrogen pH A graduated scale with numbers ranging from 0 to 14, used to determine the acidity and basicity of solutions.

درجة جهد حموضة الهيدروجين مقياس متدرج بأرقام تتراوح من 0 إلى 14، يستخدم لتحديد حموضة وقاعدية المحاليل



A profile of the scientist Soren Sorensen

He was a Danish chemist, he developed **pH** scale in 1909 to differentiate between acidic, basic and neutral solutions.

orange juice	neutral solutions	alkalis solutions
less than 7 - 0	= 7	More than 7 -14
the strength of the acidic solution increases as its pH value approaches 0	distilled water	the strength of the alkaline solution increases as its pH value approaches 14,

pH value of any solution can be measured directly and accurately by

pH meter device	Universal indicator strips
<u>Determines</u> the pH value of solutions directly and accurately, يحدد قيمة الرقم الهيدروجيني للمحاليل بشكل مباشر Where the pH value of the solution appears <u>directly</u>. On the device's digital screen حيث تظهر قيمة الرقم الهيدروجيني للمحلول بشكل مباشر. على الشاشة الرقمية للجهاز	The pH value of solutions is determined <u>approximately</u>. تقريبية يتم تحديد قيمة الرقم الهيدروجيني للمحاليل بشكل <u>The color</u> of the strip after being dipped in the solution is <u>compared</u> to the model attached to the strip package, in which each color represents a specific pH value يتم مقارنة لون الشريط بعد غمسه في المحلول بالنموذج المرفق بعنونة الشريط، حيث يمثل كل لون قيمة محددة للرقم الهيدروجيني



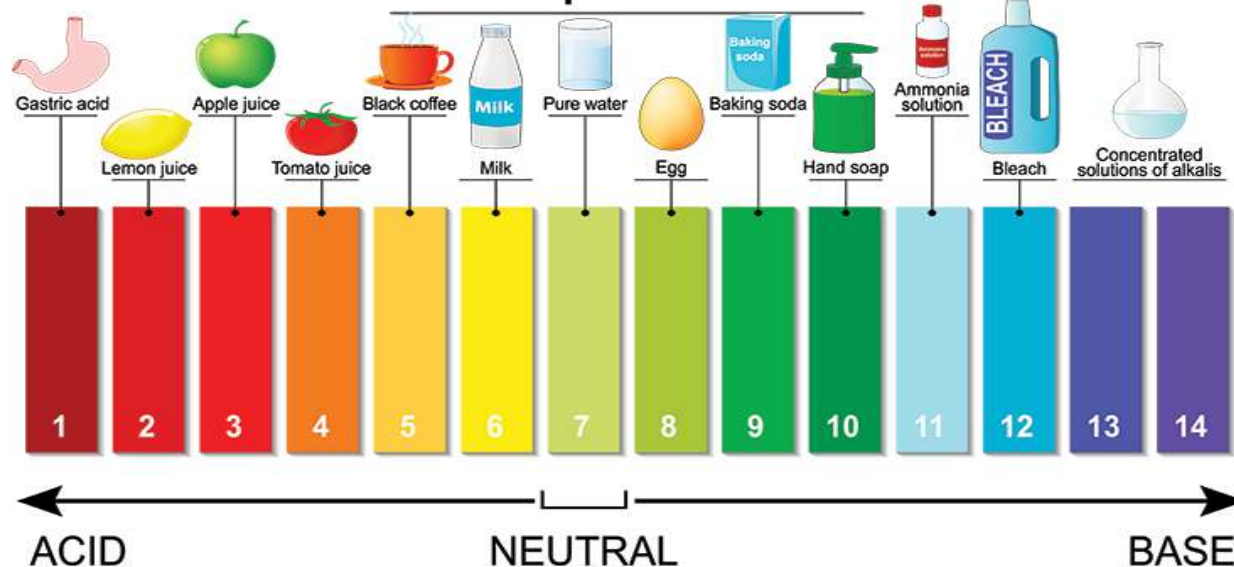
Figure (19)
Reading of pH meter for HCl acid



Figure (20)
Reading of pH meter for NaOH solution



The pH Scale



Acidic

1 -the strongest acidic substance? is stomach acid.

Because its pH value is close to 0.

2-The least acidic substances is Milk.

Because its pH value is slightly less than 7

Alkaline(basic)

1- the strongest alkaline substance? is gas oven cleaner

. Because its pH value is close to 14.

2-The least basic of these substances is eggs.

Because its pH value is slightly greater than 7

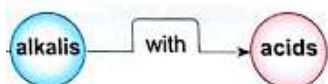
3 Compare between the acidity of grapes and tomatoes, with explanation.

4 Compare between the alkalinity of baking soda and ammonia solution, with explanation:

Life Application

pH values of hair and skin care products varies

for example, pH of a dry hair shampoo differs from that of oily hair shampoo.

2-Salts

Most of Salts are ionic compounds produced from the reaction of the acids with the alkalis,

it is formed by the combination of a cation of an alkali with an anion of an acid.

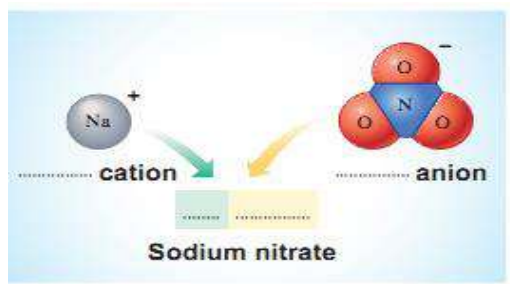


Figure (24)

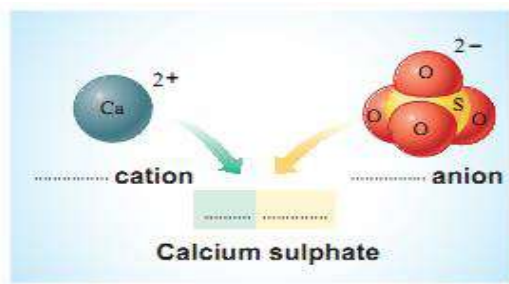


Figure (25)

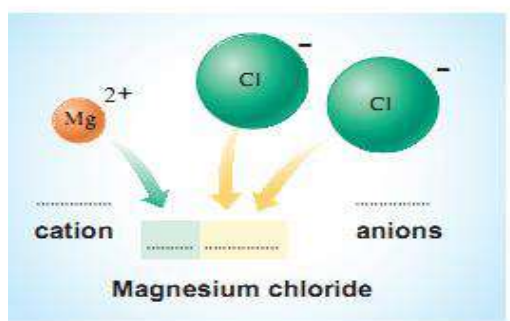


Figure (26)

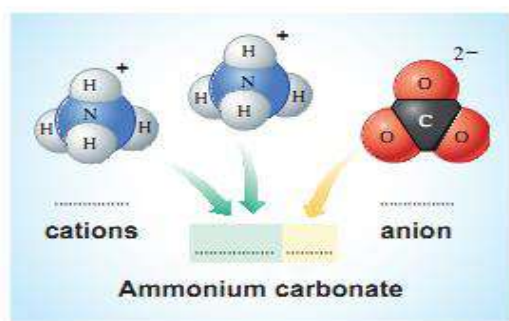


Figure (27)

Naming salts:

Next

The name of any salt begins with Anion→ cation

Ex Anion → cation

Sodium chloride

Magnesium nitrate

Writing molecular formulas for salts:

The molecular formula of any salt begins: Symbolizes (or formula) alkali cation

Which may be: Positive ion For a metallic element or Positive atomic group ion

Next by Negative ion For a Non-metallic element or Negative atomic group ion

Magnesium chloride Mg Cl_2

Mg^{2+} cation + Cl^- chloride anion $\longrightarrow \text{Mg Cl}_2$

Ammonium Sulphate $(\text{NH}_4)_2\text{SO}_4$

Ammonium NH_4^+ cation + SO_4^{2-} Sulphat anion $\longrightarrow (\text{NH}_4)_2\text{SO}_4$

The compound	The ions that make up the compound		Molecular formula of the compound
	cation	anion	
Potassium bromide	K^+	Br^-	KBr
Nickel chloride	Ni^{2+}	Cl^-	NiCl_2
Sodium sulfide	Na^+	S^{2-}	Na_2S
Sodium carbonate	Na^+	CO_3^{2-}	Na_2CO_3
Calcium sulfate	Ca^{2+}	SO_4^{2-}	CaSO_4
Potassium phosphate	K^+	PO_4^{3-}	$\text{K}_3(\text{PO}_4)_2$
Aluminum sulfate	Al^{3+}	SO_4^{2-}	$\text{Al}_2(\text{SO}_4)_3$
Ammonium nitrate	NH_4^+	NO_3^-	NH_4NO_3

Properties of salts

1- They are all solids

2-Its solutions (salts dissolved in water) and melts (molten salts) conduct electric current, such as solutions of acids and alkalis.



Take care A-Distilled water is a bad conductor of electricity.

B-Solid salts do not conduct electricity.

3-Salts differ in: 1- the color 2- water solubility 3- The pH value of its solutions

A) Salts are classified according to their colors into:

White salts		Colored salts	
Zinc sulphate ZnSO_4	Sodium carbonate Na_2CO_3	Copper sulphate CuSO_4	nickel chloride NiCl_2
		Blue color	Green color
			

B) Salts are classified according to their **solubility in water** into:

Salts that dissolve in water to form solutions.		Salts that don't dissolve in water.	
All salts of sodium, potassium, ammonium and nitrate.		All carbonate salts except sodium, potassium and ammonium carbonates.	
Copper sulphate CuSO_4	nickel chloride NiCl_2	Silver chloride. AgCl	Calcium sulfate CaSO_4

C) Salt solutions are classified according to their **pH value** into:

Acidic juice	neutral solutions	alkalis solutions
Less than 7 $\text{pH} < 7$	Its pH value is 7	More than 7 $\text{pH} > 7$
Ammonium chloride solution (NH_4Cl)	Sodium chloride solution (NaCl)	Sodium carbonate solution (Na_2CO_3)



Integration with Physics science

Salinity of the Dead Sea is the highest in the world, it is almost 10 times saltier than the Red sea, ملوحة البحر الميت هي الأعلى في العالم، فهي أكثر ملوحة من البحر الأحمر بحوالي 10 مرات،

G.R, it is not possible to drown in Dead Sea?

Where the high percentage of salts found in water leads to increasing the density of this water.

ليس من الممكن الغرق في البحر الميت؟

...حيث أن النسبة العالية من الأملاح الموجودة في الماء تؤدي إلى زيادة كثافة هذه المياه



Lesson three

1-Write the scientific term or name that

From Chemical Indicators to pH

- (1) Chemical substances whose color changes in acidic medium from its color in an alkaline medium (.....).
- (2) An Indicators that can differentiate between different acids or different alkaline according to their strength. (.....).
- (3) A Danish scientist invented the pH scale to differentiate between acidic, basic, and neutral solutions. (.....).
- (4) A scale ranging with numbers ranging from 0 to 14, used to determine the acidity and basicity of solutions. (.....) .
- (5) A device used to determine the pH value of solutions directly and accurately. (.....).

Salts and their properties

- (6) Compounds Mostly ionic, formed from of the combination of a alkali cation with acid anion. (.....).
- (7) Substance that are all solids, whose solutions and melts conduct electric current. (.....).

2.Choose the correct answer:

From Chemical Indicators to pH

(1) From the basic gases.....

- a. NH_3 b. O_2 c. H_2 d. CO_2

(2) When dissolving (CO_2) gas is in water, a solution is formed that changes the color of the universal indicator strip.

What type of solution is formed, and which ion causes the indicator to change color?

- a. acidic, OH^- b. basic, OH^- c. acidic, H^+ b. basic, H^+

(3) What two substances can be distinguished using a blue litmus strip soaked in water?

- a. Nitric acid and acetic acid. b. The two gases N_2 , CO_2
 c. The two gases N_2 , O_2 . c. Potassium hydroxide and calcium hydroxide.

(4) In the two opposite figures: a color change in the litmus strip was observed.

The red litmus strip with gas (X) turns blue.

The color of litmus strip with gas (Y) disappears

What are the gases (X) . (Y) ?

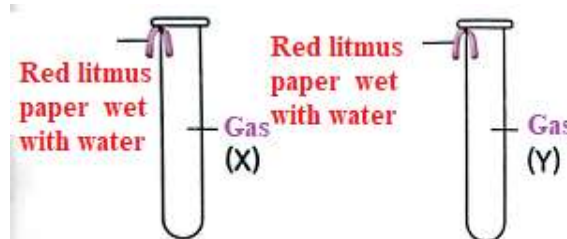
- a. (X) NH_3 , (Y) CO_2 b. (X) NH_3 , (Y) Cl_2
 c. (X) Cl_2 , (Y) NH_3 d. (X) Cl_2 , (Y) CO_2

(5) From the opposite table:

Which two pieces of evidence appear in the same color?

When each is added alone to Sodium hydroxide solution?

- a. (2), (3) b. (3), (4)
 c. (1), (2) d. (1), (3)



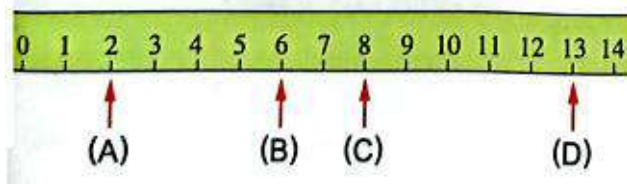
indicator	The color in acidic medium	The color in alkali medium
1	Red	Yellow
2	Yellow	Blue
3	Red	Blue
4	Violet	Green

(6) The solution whose pH value is equal to (1).

- a. Strong alkali. b. Weak alkali c. Strong acid. d. Weak acid

(7) The opposite figure shows the pH values of four different solutions. The strongest is alkaline

- a. (A). b. (B) c. (C). d. (D)



(8) The pH of acid rain may be equal to

- a. (5). b. (7) c. (9). d. (11)

(9) Which of the following substances are considered acidic substances?

- a. Bleach and liquid soap. b. Banana and tomato.
c. Yogurt and eggs. d. Lemon and baking soda

(10) The following substances have a pH value greater than 7 except:

- a. Gas oven cleaners b. Calcium hydroxide solution.
c. Ammonia solution d. Grape juice.

(11) The following table shows the colors of one of the indicators at different values of pH:

<u>color</u>	<u>Red</u>		<u>orange</u>			<u>green</u>			<u>blue</u>			<u>Violet</u>		
pH	1	2	3	4	5	6	7	8	9	10	11	12	13	14

What does the color of Indicators strip when dipped in sodium hydroxide?

- a. green b. orange c. Red d. Violet

(12) From the opposite table:

What is the color formed when adding two drops of each indicator to a solution with a pH 2 value (each separately)?

indicator	The color in acidic medium	The color in alkali medium
1	Yellow	Blue
2	Violet	Red

- a. (1) Blue. (2) Red. b. (1) Blue, (2) Violet
c. (1) Yellow. (2) Red. d. (1) Yellow, (2) Violet

(13) Adding calcium hydroxide to agricultural soil leads to...

- a. Reduce the soil pH and treat its acidity.
b. Reducing the pH value of the soil and treating its alkalinity.
c. Increase the pH value of the soil and treat its acidity.
d. Increase the pH value of the soil and treat its alkalinity.

(14) The opposite table shows the type of suitable soil.

Agriculture has four crops. What crop is best grown in soil? Its pH value ranges from 3.7 to 6.2?

- a. Sugar beets b. Garlic
c. Peas d. potato

The crop	Soil type
Sugar beets	Basic
Garlic	Basic
Peas	neutral
potato	Acidic

(15) The opposite figure: shows the information shown about face wash What is the pH range of this product?

- a. 6.3:6.5 b. 6.9:7.1
c. 7.5:7.7 d. 7.9:8.1

Salts and their properties

(16) When the cation Mg^{2+} combines with the anion CO_3^{2-} , it is formed.

- a. Acid b. Alkali c. oxide. d. salt



(17) Ca^{2+} ions combine with PO_4^{3-} ions to form a salt with the molecular formula .

- a. CaPO_4 b. $\text{Ca}_2(\text{PO}_4)_3$ c. $\text{Ca}(\text{PO}_4)_2$ d. $\text{Ca}_2(\text{PO}_4)_3$

(18) All of the following are true, except:

Choices	cation	Anion	Compound formula
a	Na^+	Cl^-	NaCl
b	Ca^{2+}	S^{2-}	Ca_2S_2
c	Al^{3+}	NO_3^-	$\text{Al}(\text{NO}_3)_3$
d	NH_4^+	CO_3^{2-}	$(\text{NH}_4)_2\text{CO}_3$

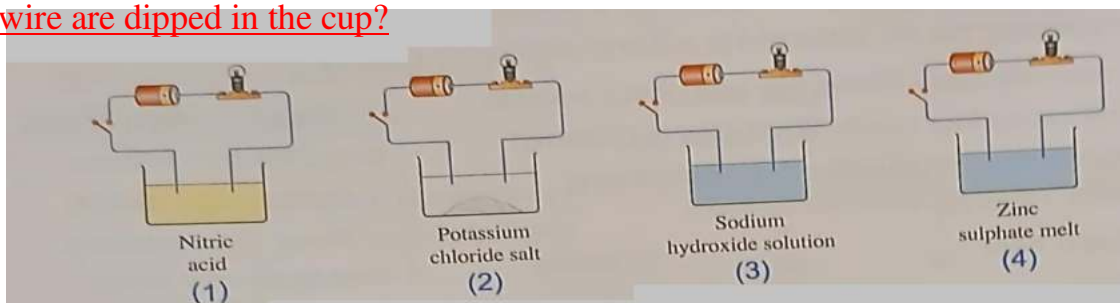
(19) Which of the following ions combine with each other to form salts?

- a. Negative chloride ions with positive hydrogen ions.
 b. Negative sulfate ions with positive ammonium ions.
 c. Negative hydroxide ions with positive sodium ions.
 d. Negative hydroxide ions with positive hydrogen ions.

(20) The correct name for the compound $(\text{NH}_4)_3\text{PO}_4$

- a. Ammonium phosphide. b. Ammonium phosphate.
 c. Nitrogen phosphide. d. Nitrogen phosphate.

(21) From the following figure In which of the following cases does the lamp light up when the ends of the wire are dipped in the cup?



- a. (1) (2) (3) only a. (2) (3) only c. (1) (2) only d. (1) (3) (4) only

(22) All of the following are properties of copper sulphate salt, except...

- a. Blue color. b. It soluble in water.
 c. doesn't conduct electricity. d. Its anion is HSO_4^-

23) The CuSO_4 compound agrees with the NiCl_2 compound in each of the following , except

- a. Type of compound. b. Solubility in water. c. the color d. Cation charge

24) All of the following salts are sparingly soluble in water, except:

- a. AgCl b. CaSO_4 c. $(\text{NH}_4)_2\text{CO}_3$ d. CuCO_3

(25) The pH of the sodium chloride solution is equal to .

- a. 0 b. 5 c. 7 d. 8

26) Which of the following substances dissolves in water to form a solution with a pH value of less than 7?

- a. Calcium carbonate b. silver chloride.
 c. Sodium carbonate d. Ammonium chloride.

(27) Which of the following salts would make a solution that turns the red litmus strip blue?

- a. NH_4Cl b. Na_2CO_3 c. NaCl d. NaNO_3

3-Complete the following sentences with the appropriate word:

- 1-.....gas removes the color of the blue litmus strip wet with water, while gas does not affect the color of the two litmus strip(red-blue)
- 2- Carbon dioxide gas changes the color of the litmus strip fromto
- 3-The color of Hydrangea planted flowers turn to..... when planted in acidic soil, while they turn to..... when planted in alkali soil.
- 4- The strength of the alkaline solution increases as the pH value approaches..... , while the strength of the acidic solution increases as the pH value approaches..... .
- 5- A change in the pH value of a solution from 3 to 7 , it means was..... then it became
- 6- The pH value of solutions can be measured directly by using..... or approximately by using.....
- (7) Most salts are formed by the combination of abase andacid.
- (8) Sodium nitrate salt consists of acation, which comes from NaOH, and an anion, NO_3^- which comes from..... acid.
- (9) The name of any salt begins with the name of..... then followed by a name..... which make it.
- (10) Salt smeltersElectric current., while distilled water..... Electric current
- (11) Molecular formula of nickel chloride salt..... And its color.....
- (12) From the salts that dissolve in water..... While salts are poorly soluble in water.....
- (13) The salinity ratio of the Mediterranean higher Sea is about times than the salinity of the Red Sea.

4-Put (✓) or (X) and correct the wrong :

- (1) When sulfuric acid is added to table sugar, it becomes black ()
- (2) The number of H^+ ions is equal to the number of OH^- ions in distilled water. ()
- (3) Acids can be distinguished from each other according to their strength by using the litmus Indicators. ()
- (4) Acidic soil is treated by adding basic materials to it, such as HCl. ()
- (5) The strength of the acidic solution increases as the pH value approaches 14. ()
- (6) The pH values of solutions are accurately measured directly using universal indicator strips. ()
- (7) The phosphate group PO_4^{3-} combines with three potassium ions, to form a potassium phosphate molecule. ()
- (8) Solid salts and their solutions are good conductors of electricity. ()
- (9) CuSO_4 salt is green in color and dissolves in water. ()
- (10) Calcium carbonate is soluble in water, while ammonium carbonate is poorly soluble in water. ()
- (11) Na_2CO_3 salt dissolves in water to form a solution with a pH value of 7. ()
- (12) The high percentage of salts in the Dead Sea water leads to a decrease in its density. ()

5-Give reasons for the following:

(1) We shall absolutely refrain from tasting, smelling or touching any chemical substance in the laboratory.

(2) The blue litmus strip changes to red when dipped in hydrochloric acid.

(3) The neutral solution (distilled water) does not affect the color of the red and blue litmus stripes.

(4) Hydrochloric acid and acetic acid cannot be distinguished using litmus strips.

(5) The pH meter is more accurate than universal strips in determining the pH value of the solution.

(6) Gas oven cleaner is made of basic materials, while milk is made of acidic materials.

(7) The acidity of grapes is stronger than that of tomatoes.

(8) The alkalinity of laundry bleach is stronger than that of baking soda.

(9) Aluminum ion Al^{3+} is linked to a phosphate group when forming aluminum phosphate, while it is linked to three nitrate groups when forming aluminum nitrate.

(10) Ammonium chloride solution is acidic, while sodium chloride solution is neutral.

(11) It is not possible to drown in the waters of the Dead Sea.



6-What are the results of each of the following:

(1) Dip the litmus strips in:

1- Strong acid (hydrochloric acid).

2. Strong alkaline solution (sodium hydroxide)

3- Acetic acid.

4- Distilled water.

(2) Bring the red and blue litmus strips wet with water to:

1- Ammonia gas NH_3

2- Carbon dioxide gas CO_2

3- Chlorine gas Cl_2

4 - Hydrogen gas H_2

(3) Place the two litmus strips in a solution with a pH of 11.

(4) Add nickel chloride and silver chloride salts separately to a quantity of water, stirring.





Unit (2) Energy and Its Applications

Lesson (1) Potential Energy

LESSON 1 GLOSSARY



Distance (d), Displacement (s) and Speed (v)

- When a camel strays in the desert, its owner tracks its footprints in the sand to ascertain its path of movement.

عندما يضل الجمل طريقه في الصحراء، يتتبع صاحبه آثار أقدامه في الرمال لتحديد مسار حركته.

The path of moving object is defined as the set of points it passes through during its motion
مسار الجسم المتحرك هو مجموعة النقاط التي يمر بها أثناء حركته



Footprints of a camel in the sand

The set of points defining the path

To know the difference between distance (d) and displacement (S),

study the following figure, which represents the paths of the car's movement from the starting point (A) to the ending point (B).

distance	displacement
From <u>starting point</u> to the ending <u>end point</u> and represented by the quantities <u>170 km - 130 km - 150 km</u>	From <u>starting point</u> to the ending <u>end point</u> and represented by the quantity <u>100 km</u>
The <u>total length</u> of any path from the <u>starting point</u> to the <u>end point</u>	The <u>shortest straight</u> path from the <u>starting point</u> to the <u>ending point</u>



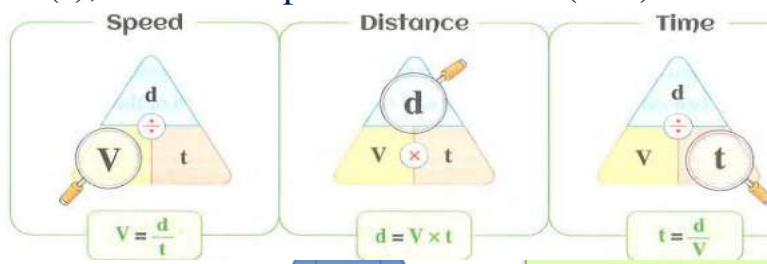
The unit of distance and displacement same metre (m) or kilometre (km), or centimetre (cm). 1 km = 1000 m, 1 m = 100 cm

Speed (v), The distance covered per unit of time

Speed (v) = _____ -

Speed units - Meter / second (m/s) or Kilometer / hour (Km/h)

Time is measured in seconds (s), or its multiples like minutes (min) or hours (h).

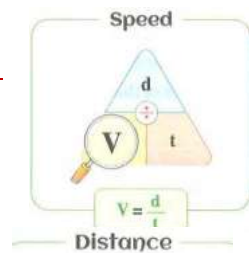


Calculating speed

Q1: Calculate the speed of an object that travels 8 m in a time of 2 s.

$$v = ? \text{ m/s} , d = 8 \text{ m} , t = 2 \text{ s}$$

$$= 4 \text{ m/s}$$



Calculating Distance

Q2: An object moves at a speed of 20 m/s. Calculate the distance that the object covers after one minute.

$$v = 20 \text{ m/s} , d = ? \text{ m} , t = 1 \text{ min}$$

$$\text{Distance} = \text{time} \times \text{speed} \quad d = 60 \times 20 = 1200 \text{ m}$$

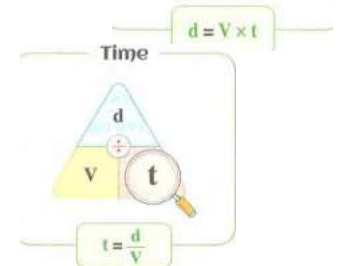


Calculating time

Q3: Calculate the time taken by a car moving at 30 m/s to cover a distance of 270 m.

$$t = ? \text{ s} , v = 30 \text{ m/s} , d = 270 \text{ m}$$

$$= 9 \text{ s}$$



It leads to an increase in traffic accidents.

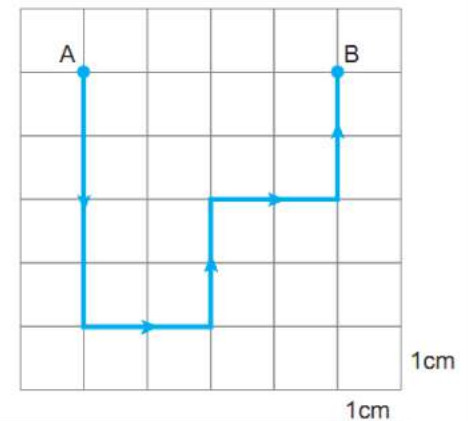
Figure (5) illustrates the path of an object from point (A) to point (B) over a time of 24 s:

Calculate each of the following:

(1) The distance. $d = 4 + 2 + 2 + 2 + 2 = 12 \text{ cm}$

(2) The speed. $= 0.5 \text{ cm/s}$

(3) The displacement. $S = AB = 4 \text{ cm}$



The case	Direction of the acting force	Direction of the object's motion	Possibility of doing work
		—	

Because the direction of the force is in the same direction as the motion

Because the body is at rest

Because the direction of the force is in the same direction as the motion

Because the direction of force is perpendicular to the direction of motion

It is concluded from the above that:

Work (W) the amount of energy required to move an object through a certain displacement in the same direction of the force which acts on it.

Measure unit

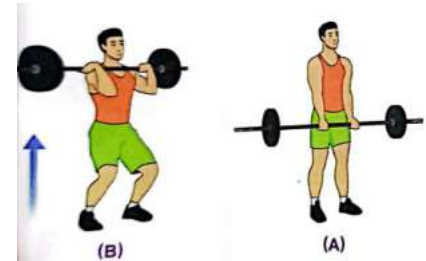
Work is in joule (J), force in newton (N), and displacement in meter (m).

$$\text{Work (W)} = \text{Force (F)} \times \text{Displacement (s)}$$

Does a person pulling a tree exert a work, and why?

No, because the displacement of the tree is zero.

The opposite figure represents two cases (A) and (B) for the player Weightlifter who:



(1) What is the amount of displacement occurring in figure (A)?

The position of weight doesn't change displacement = zero

(2) In which of the two cases is work done?

In case (B) / because the direction of the force is in same direction of weight movement.
The work is determined from the following mathematical relationship:

$$\text{Work (W)} = \text{Force (F)} \times \text{Displacement (s)}$$

Work in units of joules (J) or multiples such as kilojoules (kJ)

- Force in Newton (N) by Joule

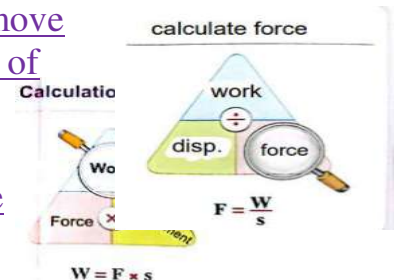
Mathematical Understanding:

Q1 A person pushes an object with a force of 20 N, causing it to move in a straight line over a distance equals 50 m in the same direction of the force. Calculate the amount of work done.

$$W = F \times S = 20 \times 50 = 1000 \text{ J}$$

Q2 To displace a box 2m, a work of 400 J is needed. Calculate the force needed to perform this work.

$$— = 200 \text{ j}$$



Each robot performs work by lifting a number of bricks to different heights

Robot (1) exerts a force equals <u>20 N</u> on 2 bricks to lift them vertically for <u>3 m</u>	Robot (2) exerts a force equals <u>30 N</u> on 3 bricks to lift them vertically for <u>3 m</u>	Robot (3) exerts a force equals <u>10 N</u> on 1 brick to lift it vertically for <u>2 m</u>	Robot (4) exerts a force equals <u>30 N</u> on 3 bricks to lift them vertically for <u>2 m</u>
			
$W = 20 \times 3 = 60 \text{ j}$	$W = 30 \times 3 = 90 \text{ j}$	$W = 10 \times 2 = 20 \text{ j}$	$W = 30 \times 2 = 60 \text{ j}$

Energy (E)

Energy is the ability to do work, it is measured like work in joule (J).

(J). الطاقة هي القدرة على القيام بعمل، وتقاس مثل العمل بالجول

• **Forms of energy include :**

- Potential energy. - Kinetic energy

تشمل أشكال الطاقة. الطاقة الكامنة الطاقة الحركية -

Potential Energy (PE): الطاقة الكامنة (PE):

When a person lifts a book from the floor to a higher shelf he does work, this work is converted into stored energy in the book

عندما يرفع الشخص كتاباً من الأرض إلى رف أعلى فإنه يقوم بعمل يتحول إلى طاقة مخزنة هذا العمل في الكتاب

Scientific Processes: Controlling Variables العمليات العلمية: التحكم في المتغيرات

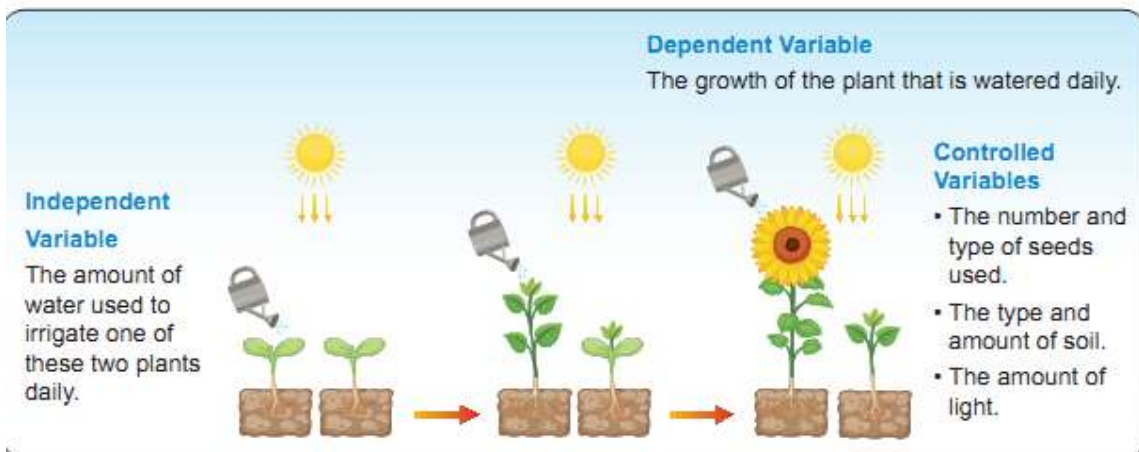
Controlling variables is one of the skills in scientific research and the design of scientific comparative experiments. It is essential for studying causes and their resultant effects.

إن التحكم في المتغيرات من المهارات الأساسية في البحث العلمي وتصميم التجارب العلمية المقارنة. وهو ضروري لدراسة الأسباب والآثار المترتبة عليها

The three main variables are:

المتغيرات الرئيسية الثلاثة هي

- **Independent Variable (Cause):** The variable that is changed during the experiment.
المتغير المستقل (السبب): المتغير الذي يتغير أثناء التجربة.
- **Dependent Variable (Effect):** The variable to be tested, which changes in response to changing the independent variable.
المتغير التابع (الآثار): المتغير الذي سيتم اختباره، والذي يتغير استجابة لتغيير المتغير المستقل.
- **Controlled Variables:** The variables that are controlled to remain constant throughout the experiment.
المتغيرات المتحكم فيها: المتغيرات التي يتم التحكم في بقائها ثابتة طوال التجربة.



Energy it is the ability to do work
(unit joule)



As the player's energy increases, his ability to kick the ball (do work) increases

Potential energy (PE) This energy stored in the object (Book)

What does it mean that: Potential energy in a body = 20 J.

It means that the stored energy in the body as a result of the work done on it equals 20 J.

Factors Affecting Potential Energy (weight -height)

1- The weight (W)

Activity 2 Discover; The effect of the object weight

Used tools:

- A basin filled with fine sand.
- 3 glass marbles of different weights.
- A metric ruler.

Steps:

- 1- Drop the small marble from a height of 50 cm above the surface of the sand.
- 2- Repeat the previous step with the other two marbles from the same height

Classify each of the following as (Dependent – Independent – Controlled) variable :

- Weight of the marbles :

Observation

The depth of the crater (hole) formed by each marble in the sand increases with increasing the weight of the marble.

Conclusion An Increase in the weight of the object leads to an increase in potential energy. and vice versa.

Controlled variables:

-Height of the marbles above the surface of the ground. -Amount of sand.

Independent variable: Weight of the marbles.

Dependent variable: Depth of the crater (hole) formed by each marble.

2 Height of the object above the surface of the ground level (h)

Activity The effect of the object height above the ground surface on its potential energy.

Steps 1. Drop the marble from a height of 50 cm above the surface of the sand.

2 Repeat the previous step with increasing the height to 75 cm, and then to 100 cm

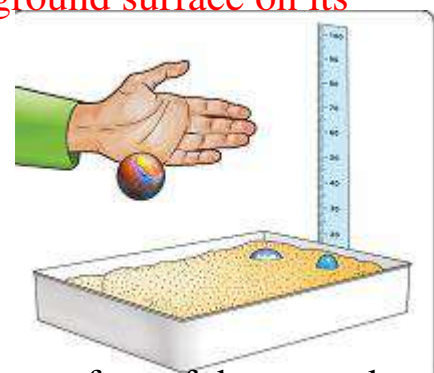
Observation The depth of the crater formed by the marble increases as the height above the ground surface increases.

Conclusion Increasing the height of the object above the surface of the ground increases its potential energy, and vice versa

Controlled variables: Weight of the marble. Amount of sand.

Independent variable: Height of the marble above the ground surface.

Dependent variable: Depth of the crater formed by the marble each time,.



Potential energy (PE) = Weight of the object (w) × Height (h)

Potential energy is measured in joule (J).

∴ Weight of the object (w) = Mass of the object (m) × Gravitational field intensity (g)

Potential energy (PE) = Mass of the object (m) × Gravitational field intensity (g) × Height (h)

It is noted that the gravitational field intensity is approximately equal 10 N/kg

What does it mean that: Potential energy in a body = 20 J.

It means that the stored energy in the body as a result of the work done on it equals 20 J.

What it means that: Potential energy of a body is zero

It means that the body is on the ground.

Calculation of potential energy

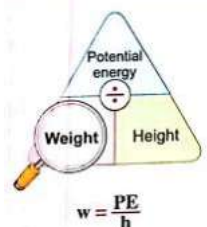


calculate the potential energy of a body of mass 6 kg that is at a height of 3m from the ground level. Gravity = 10N/kg

PE = ? J, m = 6kg, h = 3m, g = 10 N/kg

PE = m × g × h = 6 × 10 × 3 = 180 J

Calculation of weight

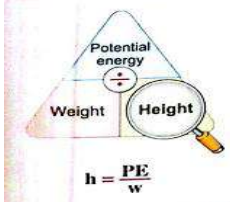


Calculate the weight of the body that has a potential energy of 88 J, after being lifted to a height of 11 m.

w = ? N, PE = 88 J, h = 11 m

$W = \frac{P.E}{H} = \frac{88}{11} = 8 \text{ N}$

Calculation of height



Calculate the height of the body from the ground, with a weight of 4 N, and a potential energy of 10J

h = ? m, w = 4N, PE = 10 J

$h = \frac{P.E}{w} = \frac{10}{4} = 2.5 \text{ m}$

A work equals 150 kJ is done to raise an object with a mass of 50 kg from the surface of the ground level to a height (h) above the ground.

“Given that the gravitational field intensity is 10 N/kg, 1 kJ = 1000 J” Calculate:

1- The potential energy of the object.

∴ The potential energy of the object represents the amount of work done on object.

∴ Potential energy of the object = 150 kJ

2- The height (h) :

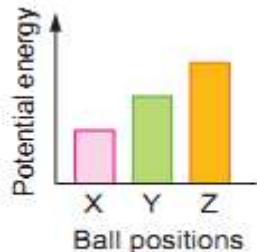
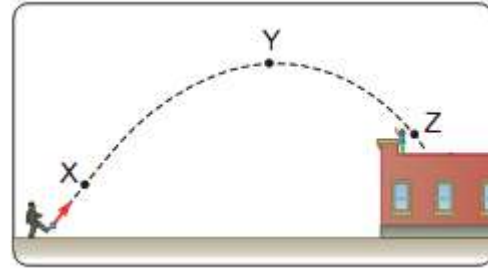
$150 \times 1000 = 50 \times 10 \times h$

————— = 300 m

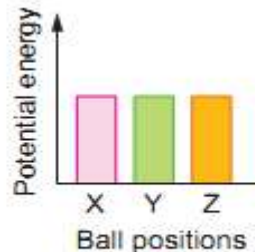


Figure (16) illustrates the path of a football that has been kicked, the letters (X), (Y) and (Z) indicate three positions along the ball path.

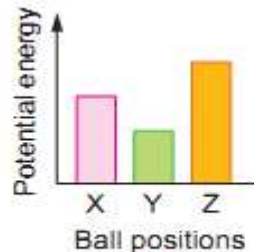
Which of the following represents the potential energy of the ball at the positions X, Y and Z?



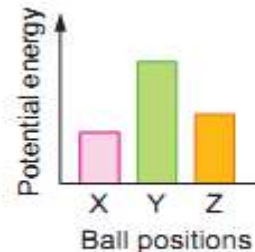
(a)



(b)



(c)



(d)

Solution idea (D)

...potential energy increases with increasing height above the ground.

...potential energy at $X < Z < Y$

What Happens to Potential Energy in the Following Cases?

First case: If the weight of the body increases to double with a constant height.

$$w_2 = 2 w_1$$

$$h_2 = h_1$$

Potential energy increases to double.

Second case: If the vertical distance decreases by half, when lifting a body with constant weight.

$$w_2 = w_1$$

$$h_2 = \frac{1}{2} h_1$$

Potential energy decreases by half.

Third case: If the weight of the body increases to double, and the vertical distance is halved when lifting it.

$$w_2 = 2 w_1$$

$$h_2 = \frac{1}{2} h_1$$

Potential energy remains the same.



Lesson one1. Write the scientific termFrom the Beginning of the Lesson to Work:

- (1) The set of points through which an object passes during its motion.
- (2) The total length of the path taken by an object during its movement from a starting point to an ending point.
- (3) The shortest straight path connecting the starting point and the ending point in a fixed direction.
- (4) The distance traveled per unit of time.
- (5) The amount of energy needed to move an object a certain displacement in the same direction as the force acting on it.
- (6) The resulting of work done divided by the displacement and is measured in Newton.

Potential Energy:

- (7) One of the skills of scientific research and designing comparative experiments.
- (8) The variable that is changed during an experiment.
- (9) The variable to be tested that changes based on the independent variable.
- (10) The variable that remain constant during an experiment.
- (11) The ability to do work.
- (12) The energy stored in an object as a result of the work done on it.
- (13) The product of an object's mass and the gravitational field strength.

2. Choose the correct answer from the given options:From the Beginning of the Lesson to Work:

(1) All the following are units of measuring distance, except:

- * (A) cm (B) km (C) kg (D) m

(2) When an object moves a distance of 20 m in a straight line in a fixed direction, the magnitude of its displacement is:

- * (A) zero (B) 20 m (C) 40 m (D) 80 m

(3) A car moves a distance d in a time t. What is the formula used to calculate this car's speed (v)?

- A) $v = d \times t$ (B) $v = t/d$ (C) $v = \frac{1}{2} \times d \times t^2$ (D) $v = d/t$

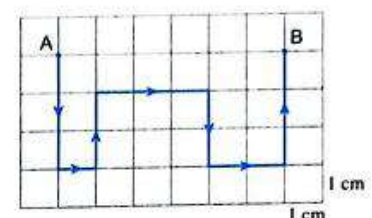
(4) The opposite figure illustrates the path of an object from point A to point B, in a time of 32 seconds.

-1- The magnitude of the distance is equal to:

- (A) 4 cm (B) 16 m (C) 12 cm (D) 16 cm

-2- The speed of the object is equal to:

- (A) 0.2 cm/s (B) 0.5 cm/s (C) 1 cm/s (D) 1.25 cm/s



(5) If a student moves from his house to his school, which is 900m away from home, with a speed of 5 m/s, then he arrives at the school in a time of:

- (A) 30s (B) 3 min (C) 180 min (D) 0.5 h

(6) Work is measured in the unit of:

- * (A) Joule (B) Newton (C) Watt (D) Kilometer

(7) What is the magnitude of the work done by a student who pushes a wall of his room with a force of 500 N?

- (A) zero (B) 225 J (C) 500 J (D) 1000 J

(8) If a force of 65 N acts on a stationary object and it moves a distance of 10 m in the direction of the force, the magnitude of the work done is:

- (A) 0.65 J (B) 6.5 J (C) 65 J (D) 650 J

(9) When the force acting on a body increases to double its value, while the displacement remains constant, the work done:

- (A) Decreases by half (B) increases to double.
(C) increases to four times its value. (D) decreases to a quarter.

Potential Energy:

(10) What happens to the dependent variable in comparative experiments?

- * (A) Changes with changes in the independent variable.
- * (B) Changes with changes in the controlled variable.
- * (C) Does not change with changes in the independent variable.
- * (D) Does not change with changes in the controlled variable.

(11) What is the independent variable in an experiment designed to study the relationship between the height from which a ball is dropped onto sand and the depth of the resulting depression?

- (A) Size of the ball. (B) Force acting on the ball.
(C) Height of the ball. (D) Depth of the depression.

(12) What physical quantity has the same unit of measurement as force?

- (A) Energy (B) Displacement (C) Speed (D) Weight.

(13) The potential energy of a body increases when:

- (A) its speed increases (B) its weight increases.
(C) its height decreases. (D) its weight decreases.

(14) The potential energy of an object equals zero at:

- (A) its maximum height. (B) at the ground level.
(C) its increase in mass (D) increase in speed

(15) Which of the following correctly expresses the relationship between the potential energy of an object at the top of a mountain (position 1) and its potential energy at the surface of the Earth (position 2)?

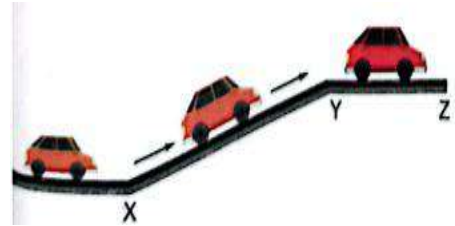
- (A) $PE(1) > PE(2)$ (B) $PE(1) = PE(2)$
(C) $PE(1) < PE(2)$ (D) $PE(2) - PE(1) = 0$

(16) If a work of 150 J is done to lift an object of mass 50 kg from the surface of the Earth to a height h above the ground, the value of the height (h) is: [gravitational acceleration $g = 10 \text{ N/kg}$]

- (A) 30 km (B) 300 m (C) 1500 m (D) 1500 km

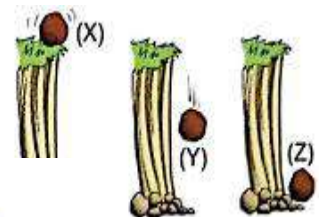
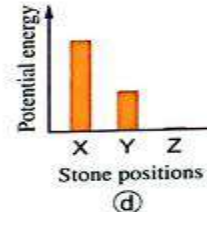
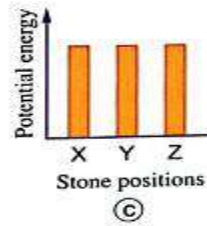
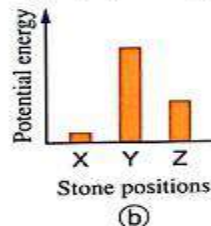
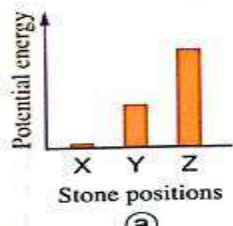
- (17) When the height of an object above the surface of Earth doubles, the potential energy:
- (A) decreases to one-fourth. (B) Remains constant.
(C) increase to Doubles. (D) Decreases to half.

(18) The opposite figure illustrates three positions in a car's path of motion. Which of the following expresses the change in the car's potential energy as it moves from X to Y and from Y to Z, respectively?



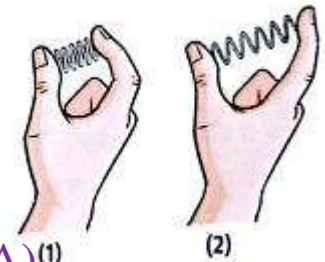
- (A) Increases, increases.
(B) Increases, does not change.
(C) Does not change, increases.
(D) Does not change, does not change.

(19) The opposite figure illustrates the path of a stone falling from a height with letters (X), (Y) and (Z) representing three positions within the path of the stone's movement. Which of the following expresses the potential energy of the stone at the three positions (X), (Y), and (Z)?



(20) In the opposite figure Which spring stores more energy?

- * (A) (1), because the work done on it is greater.
* (B) (1), because the work done on it is less.
* (C) (2), because the work done on it is greater.
* (D) (2), because the work done on it is less.



3. Choose from column (B) what matches column (A)

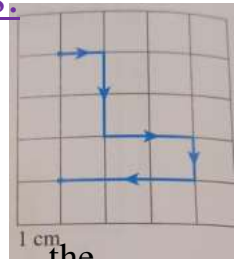
1- (A)	(B)
Physical Quantity	Formula Used
(1) Potential Energy	(1) Force $\times$ displacement
(2) Speed	(2) Mass $\times$ gravitational field strength
(3) Work	(3) Weight $\times$ height
(4) Weight	(4) Mass $\times$ height
	(5) Distance $\div$ Time

2- (A)	(B)
Physical Quantity	Measurement Unit
(1) Energy	(1) N/kg
(2) Mass	(2) s
(3) Weight	(3) kg
(4) Height	(4) J
(5) Speed	(5) m
(6) Gravitational field strength	(6) m/s
	(7) N

4. Complete the following sentences with appropriate words:

From the Beginning of the Lesson to Work:

- (1) The opposite figure: depicts the path of movement of an object moving a distance of and its displacement is
- (2) Unit of measurement Speed of an object isor
- (3) 1 Joule = × meter.
- (4) A force does not do work when the direction of the force is the direction of motion, or when the object remains
- (5) If a force of 200N acts on a car, but the car does not move from its position, the work done on it is equal to
- (6) If the work done to move a box a displacement of 2m is equal to 400 j, then the force required to do this work is equals.....



Potential Energy:

- (7) Energy has many different forms, including
- (8) Energy is measured in the unit ofwhich is the same unit as.....
- (9) Potential energy of an object = × and its unit is
- (10) The potential energy of an object depends on itsand its
- (11) Mass is measured in while weight is measured in
- (12) The chemical energy present in car fuel is a type of energy stored inand turns into when a chemical reaction occurs

5-Place a (✓) or (X) and, correct the wrong:

From the Beginning of the Lesson to Work:

- (1) The product of an object's speed multiplied by time equals the work. ()
- (2) Speed is measured in km/h when distance is measured in m and time is measured in s. ()
- (3) A train traveling a distance of 200 km in 150 minutes has a speed of 90 km/h()
- (4) An object's speed increases when the distance covered in the same time increases. ()
- (5) Force does work when its direction is perpendicular to the direction of motion()
- (6) When a robot exerts a force of 10N on 2 bricks to raise them vertically by 3m, it does work equal to 40J. ()
- (7) The variable that is changed during an experiment is known as the independent variable. ()
- (8) The chemical energy present in food and fuel is stored potential energy. ()

6-State the mathematical relationship between

- (1) Speed and distance.
- (2) Work and force.
- (3) Potential energy of an object and its height above the surface of the Earth.
- (4) Weight and mass.
- (5) Potential energy and gravitational field strength.

7-Give reason for each the following:

- (1) The difference value of the distance compared to the displacement for the same moving object, even although they have the same unit of measurement.
- (2) A person pushing against a wall does not do work.
- (3) A person pushing a shopping trolley performs work.
- (4) The role of fuel in a car is similar to the role of food in a living organism.

8-What is meant by:

From the Beginning of the Lesson to Work:

- (1) The distance covered by an object equals 20 m.
- (2) The displacement of an object is 60 mm.
- (3) The shortest straight path between two positions is 5m.
- (4) An object moves a distance of 40 m in 20 seconds.
- (5) A car is traveling 20 km in 2 hours.
- (6) The potential energy of an object is equal to 20 J
- (7) The energy stored by an object due to work being done on it is 100 J.
- (8) The potential energy of an object at a height of 10m is 80 J



9. When does each of the following occur:

- (1) When the distance traveled is equal to the displacement.
- (2) When the speed of an object is equal to the distance traveled.
- (3) When a force does work.
- (4) When a force does not do work.
- (5) When the potential energy of an object is equal to zero.



10. What happen in the following cases:

- (1) Cars exceed the permitted speed limits on the road.
- (2) Exerting a suitable force to a object at rest
- (3) Doubling the weight of an object while constant height above the surface of Earth constant (with respect to its potential energy).
- (4) Halving the vertical distance that an object moves from the surface of Earth while keeping its mass constant (with respect to its potential energy).

11. Identify the word or phrase that does not fit in, then state what links the remaining words or phrases:

- (1) Time / Mass / Speed / Distance
- (2) Work / Force / Displacement / Kinetic energy
- (3) Potential energy / Square of the speed / Height / Weight
- (4) Distance / Height / Speed / Displacement
- (5) Newton / Force / Joule / Kilogram



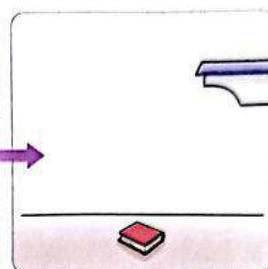
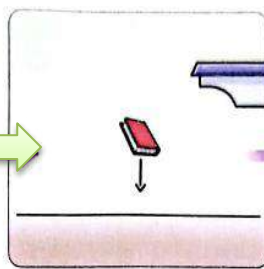
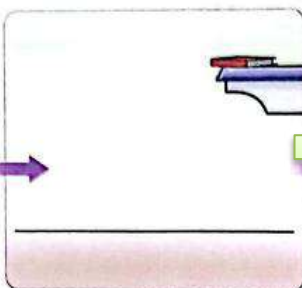
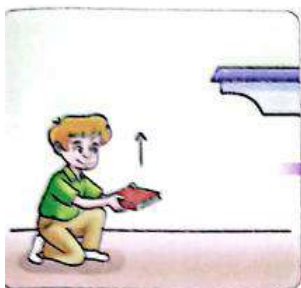
Lesson (2) Kinetic Energy (KE)

Lesson two

Kinetic
Energy

When a book is lifted to a shelf higher than the ground,
the work done on the book is stored as potential energy.

When the book is left to fall,
the stored energy in the book is released in the form of kinetic energy due to the motion of the book this energy is known as Kinetic Energy (KE).

Kinetic Energy (KE)...

-The energy acquired by an object as a result of its motion.

-The work done to move an object.

Measuring unit of Kinetic energy is in joules (J).

What Does It Mean? A kinetic energy of an object equals 50 J,

this means the energy acquired by this object as a result of its movement is equal to 50 J.

Factors Affecting Kinetic Energy 1- the mass 2- the speed

1- the mass

Activity (1) The effect of the mass of a body on its kinetic energy

Tools used Two balls of different mass. Empty bucket

Steps

1- Let the ball of small mass fall from the inclined plane.

2- Repeat the previous step with the larger ball.

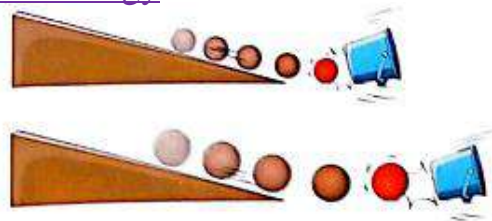
Observation

The effect of the ball on the empty bucket increases (the distance the bucket moves), with the increase in the mass of the ball.

Conclusion Increasing the mass of a moving body leads to an increase in kinetic energy, and vice versa.

Independent variable: mass of the ball.

Control variables: - Height of the inclined plane (ball speed).



Dependent variable: The distance the bucket moves (as a result of the kinetic energy of the ball).

1- the Speed

Activity (1) The effect of the Speed of a body on its kinetic energy

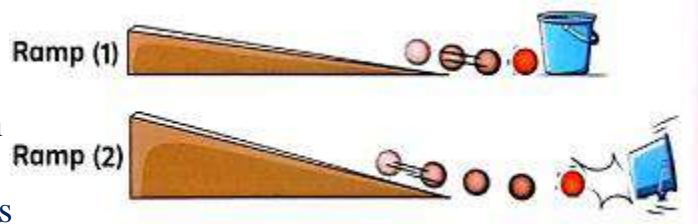
Tools used Two inclined planes. Empty bucket, ball

Steps 1- Let a ball of small mass fall

From the ramp (1)

Then from the ramp (2).

Observation The effect of the ball on the empty bucket increases (the distance the bucket moves), increases with increase the high of the ramp (speed of the ball)



Conclusion Increasing the speed of a moving body leads to an increase in kinetic energy, and vice versa.

Independent variable: height of inclined plane (speed of the ball).

Control variables: . mass of the Ball. The bucket

Dependent variable: The distance the bucket moves (as a result of the kinetic energy of the ball).

from the previous that: Kinetic energy (KE) $\equiv \frac{1}{2}$ mass (m) $\times$ Square of the speed (v)²

The kinetic energy (KE) of any object depends on both :

- The mass of the object (m) measured in kilogram (kg).
- The speed of the object (v) measured in meter per second (m/s).

• The kinetic energy is estimated by the following mathematical relation

$$KE = \frac{1}{2} mv^2$$

Kinetic energy is measured in Joule (J).

What is it mean when? The kinetic energy of an object is equal to zero.

This means that the object at rest (its speed is zero).

Problem?

(Q1): Calculate the kinetic energy of a metal ball with a mass of 2 kg moving at a speed of 3 m/s.

Answer KE = ? J, m = 2 kg, v = 3 m/s

$$KE = \frac{1}{2} mv^2 = \frac{1}{2} \times 2 \times (3)^2 = 9 \text{ J}$$

(Q2): Calculate the mass of a body that has a kinetic energy of 48 J, and a speed of 4 m/s. m = ? kg, KE = 48 J, v = 4 m/s

$$m = (2 \times KE) / v^2 = (2 \times 48) / 4^2 = 6 \text{ kg}$$

(Q3): Calculate the velocity of a body with a mass of 10 and a kinetic energy of 500J.

$$v^2 = (2 \times KE) / m$$

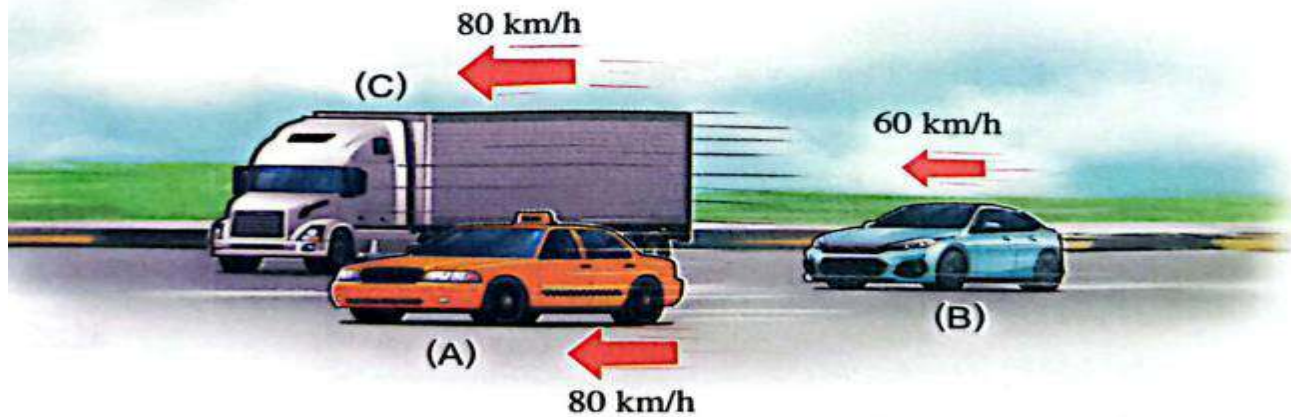
$$v = \sqrt{(2 \times KE) / m} = \sqrt{(2 \times 500) / 10} = \sqrt{100} = 10 \text{ m/s}$$

$$v = \sqrt{v^2} = \sqrt{100} = 10 \text{ m/s}$$

What Happens When? With Explanation:

Two cars (A) and (B) are moving, with the same mass and different speeds

A car (A) and a truck (C) are moving, with the same speed.



Car (A) performs more work than Car (B), despite having the same mass.

Explanation:

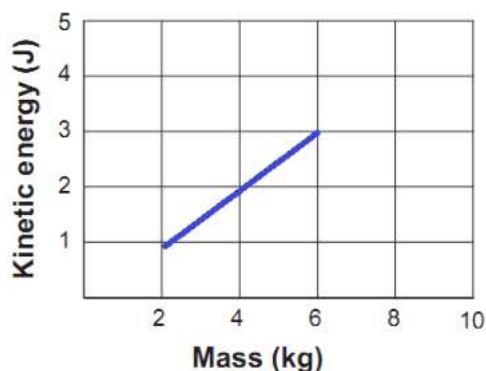
Because the kinetic energy of a body increases with **increased speed**, and therefore it **produces more work**.

The Truck (C) performs more work than Car (A), despite having the same speed.

Because the kinetic energy of an object increases with **increased mass**, and therefore it **produces more work**.

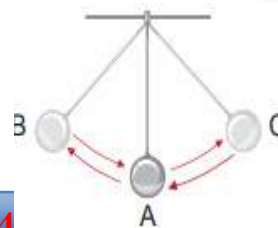
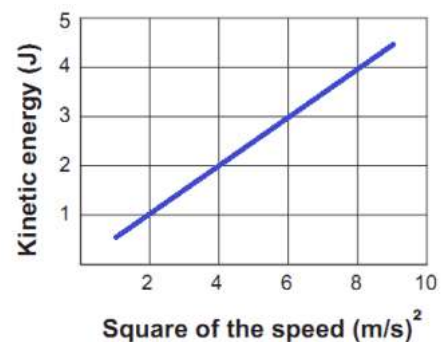
relation between kinetic energy and mass for different objects at constant speed

<u>Mass (kg)</u>	<u>Kinetic energy (J)</u>
2	1
4	2
6	3



the relation between kinetic energy and the square of the speed of an object at constant mass

<u>Speed (m/s)</u>	<u>Square of speed (m/s)²</u>	<u>Kinetic energy (J)</u>
1	1	0.5
2	4	2
3	9	4.5



What Happens to Kinetic Energy in the Following Cases?

1- If the mass of a moving object is halved, and the speed remains constant.

Kinetic energy is decrease to half

2- If the speed of a moving object is doubled, while the mass remains constant.

Kinetic energy increases four times.

3- If the mass of a moving object is halved and its speed is doubled.

Kinetic energy increases to double its original value.

4- If the mass of a moving object is reduced to a quarter, and its speed is doubled.

Kinetic energy remains the same (doesn't change)

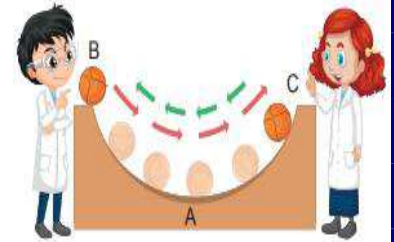
The Relation Between Potential Energy and Kinetic Energy:

$$m_2 = \frac{1}{2} m_1$$

$$v_2 = v_1$$

$$v_2 = 2 v_1$$

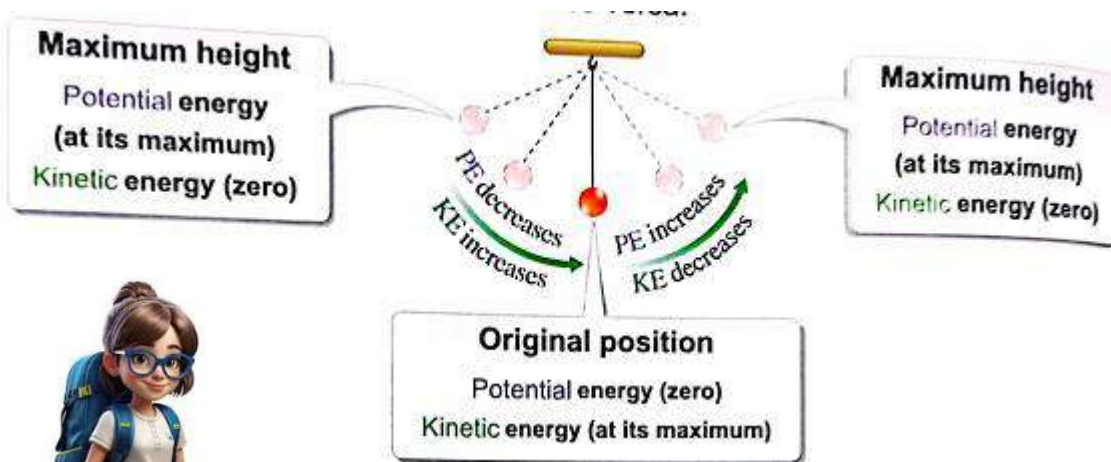
$$m_2 = m_1$$



$$v_2 = 2 v_1$$

$$m_2 = \frac{1}{4} m_1$$

	Potential energy (PE)	Kinetic energy (KE)
<u>Definition</u>	Energy stored in the body due to work done on it	-The work done to move an object.
<u>factors affecting</u>	The weight - The height	- The mass -The speed
<u>Mathematical relationship</u>	$PE = W \times H$	$KE = \frac{1}{2} m \times V^2$
<u>measuring Unit</u>	Joule (J)	Joule (J)



When the ball is pulled up from its original position A to position B, potential energy is stored in the ball, and when it is released to roll down, the potential energy is converted to kinetic energy

What is the relation between the potential energy and the kinetic energy of an object?

Activity:

1 Pull the pendulum ball from its original position (A) to position (B).

2 Release the ball to move freely What do you observe?

- What is the speed of the ball at positions (B) and (C)?
- Identify the position(s) where: - Kinetic energy is at its maximum

- Kinetic energy equals zero,

- Potential energy is at its maximum,

- Potential energy equals zero,

- Complete with what happens to both potential energy and kinetic energy of the pendulum ball during its motion:

It is clear from the previous that :

• The object has the maximum potential energy at its highest point above its original position, while its kinetic energy becomes at its maximum when passing through its original position.

• The decrease in potential energy is followed by an increase in kinetic energy, The amount of decreasing in potential energy equals that of increasing in kinetic energy.

• The summation of potential energy and kinetic energy of any moving object is known as **Mechanical Energy (ME)**, the mechanical energy of any object is constant value,

The mathematical relation:

$$\text{Mechanical energy (ME)} = \text{Potential energy (PE)} + \text{Kinetic energy (KE)}$$

The mechanical energy of a freely falling object equals:

- Potential energy at its maximum height.
- Kinetic energy at the moment it reaches the ground.

Test Your Understanding 1- Calculate the mechanical energy of a moving object, if its potential energy is 1000J and its kinetic energy is 230 J.

$$\text{ME} = ? \text{ J}, \text{PE} = 1000 \text{ J}, \text{KE} = 230 \text{ J}$$

$$\text{ME} = \text{PE} + \text{KE} = 1000 + 230 = 1230 \text{ J}$$

2- In the opposite figure: an object with a mass of 5kg falls vertically from point A to ground level. Calculate the speed of the object at point B

[Knowing the gravitational field strength is 10 N/kg]

At maximum height:

$$* \text{ME} = \text{PE} = m \times g \times h = 5 \times 10 \times (3+9) = 600\text{J}$$

At position (B):

$$\text{PE} = 5 \times 10 \times 9 = 450 \text{ J}$$

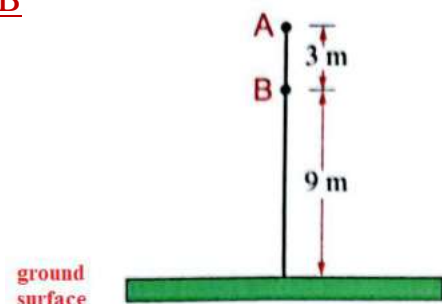
$$\text{KE} = \text{ME} - \text{PE} = 600 - 450 = 150 \text{ J}$$

$$\text{KE} = \frac{1}{2} m v^2$$

$$v^2 = (2\text{KE})/m = (2150)/5 = 60(\text{m/s})^2*$$

$$v = \sqrt{60} = 7.75 \text{ m/s}$$

$$\therefore v = \sqrt{v^2} = \sqrt{60} = 7.75 \text{ m/s}$$



3- A moving pendulum has a ball with a mass of 0.4 kg. Its mechanical energy when it reaches maximum height = 8 J. Calculate

- (1) The potential energy of the ball at its maximum height.
 (2) The speed of the ball at the moment it passes through its original position.

(1) Potential energy at maximum height = 8 J.
 (2) Kinetic Energy when passing through the original position = Mechanical Energy = 8J

$$KE = \frac{1}{2} m v^2 \quad - \quad v^2 = (2KE)/m = (8)/0.4 = 20 \quad (m/s)^2$$

$$v = \sqrt{20} = 4.47 \text{ m/s} \quad \therefore v = \sqrt{40} = 6.3 \text{ m/s}$$



Medical Application

Avoid lifting heavy objects above ground level in a manner that harms your spine,

- تجنب رفع الأشياء الثقيلة عن مستوى الأرض بطريقة تضر بالعمود الفقري،

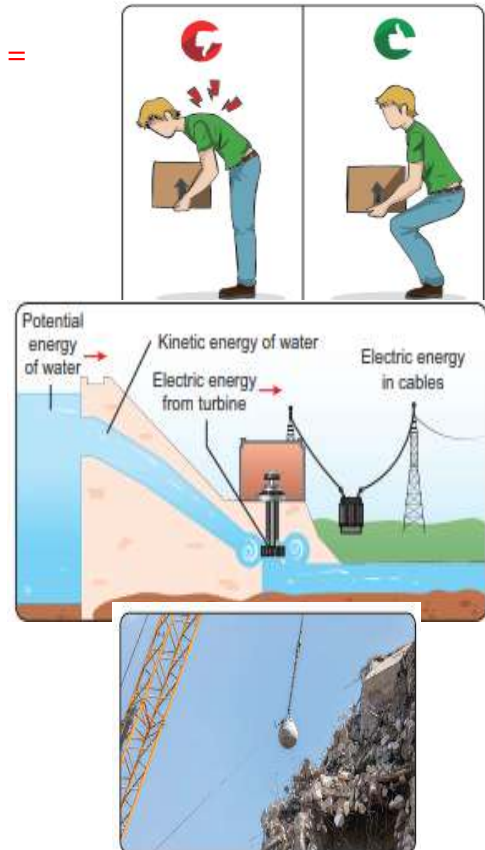


Life Applications

1- Generation of Electricity from the High Dam:

The High Dam in Aswan is one of the most important engineering projects in Egypt in the last century in using water energy, as the potential energy of water held behind the dam is converted into kinetic energy when it rushes downwards.

This kinetic energy of water drives turbines which generate electricity in a sustainable way



2 Demolition Ball: The demolition ball is used for demolishing old buildings as a result of the conversion of the potential energy stored in the heavy ball (which is suspended at a height) into kinetic energy upon its release.

This energy is transferred to the building upon the ball impact, causing its demolition



Lesson two1. Write the scientific term

- (1) The energy acquired by an object as a result of its motion.
- (2) The work done in moving an object.
- (3) The product of the $\frac{1}{2}$ mass multiplied by the square of the speed.
- (4) The sum of the potential and kinetic energy of any moving object.
- (5) The energy used to operate turbines to generate electricity at the High Dam.
- (6) A heavy tool used to demolishing old buildings as a result of transforming potential energy into kinetic energy.

2. Choose the correct answer from the given options:

(1) A student is conducting an experiment to verify that an object's kinetic energy increases with increasing speed. What is the independent variable in this experiment?

- (A) Speed of the object (B) Kinetic Energy of the object
(C) Mass of the object (D) Type of object material

(2) The kinetic energy of an object depends on:

- (A) The object's weight and its height
(B) The object's mass and gravitational field strength.
(C) The object's mass and speed
(D) The object's mass, speed, and time.

(3) Which of the following objects does not have a kinetic energy?

- (A) Car moving along a straight path (B) A leaf falling downwards.
(C) A bird flying in the sky (D) An object resting on a table.

(4) The kinetic energy of a moving object can be calculated using the following equation :

- (a) mgh (b) $\frac{1}{4}mv^2$ (c) $\frac{d}{t}$ (d) $\frac{1}{2}mv^2$

(5) If an object with a mass of 5kg is moving at a speed of 10 m/s, then its kinetic energy will become..... if its mass becomes half, while its speed remains constant.

- (A) 250J (B) 125J (C) 100 J (D) 2500 J

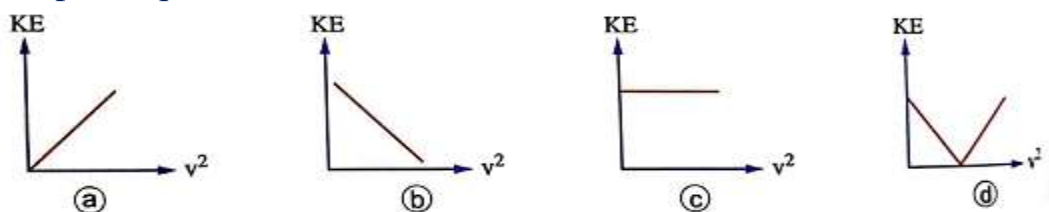
(6) The Joule is the measuring unit of kinetic energy and it is equivalent to

- (A) g/cm^3 (B) N (C) $kg \times (m/s^2)$, (D) $kg \ s^2$

(7) If the mass of an object is halved and its velocity remains constant, then the kinetic energy:

- (A) Decreases to half (B) Decreases to quarter
(C) Increases four times (D) It doubled

(8) The diagram illustrates the relationship between the kinetic energy (KE) of an object and its speed squared (v^2), when the mass remains constant. Mechanical Energy



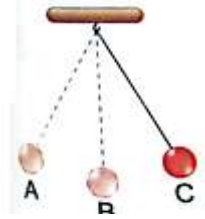
(9) In the opposite figure:

-1- The work done on the ball at point (A) is stored in the form of:

- (A) Potential Energy (B) Kinetic Energy
(C) Gravitational Energy (D) Chemical Energy.

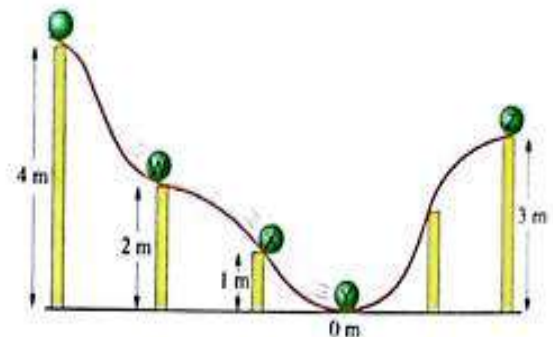
-2- When the pendulum's ball passes through position (B) its mechanical energy is equal to:

- (A) Gravitational Energy (B) Chemical Energy
(C) Kinetic Energy (D) Potential Energy.



(10) The opposite diagram: shows a ball rolling down a slope. Which of the following is true?

- (A) The potential energy of the ball at position (X) is greater than at position (Z).
(B) The kinetic energy of the ball at position (Y) is greater than at position (W).
(C) The potential and kinetic energies are equal at position (X).
(D) The potential and kinetic energies are the maximum at position (Z).



(11) Which of the following describes the energy of a tennis ball falling down a flight of stairs?

- (A) The kinetic energy decreases during its fall.
(B) The potential energy increases continuously while falling
(C) The kinetic energy has the highest value the moment of its fall.
(D) The potential energy has the highest value at the moment of its fall.

(12) Which of the following expresses the energy of an object falling freely from a height by the effect of the gravitational force?

Choice	Potential energy	Kinetic energy	Mechanical energy
a	Decreases	Decreases	Increases
b	Decreases	Increases	Remains the same
c	Increases	Decreases	Decreases
d	Increases	Increases	Remains the same

(13) At the maximum height reached by an object thrown vertically upwards, theis zero.

- (A) Potential Energy (B) Kinetic Energy
(C) Mechanical Energy (D) Mass of the Object.

(14) When an object falls vertically from a height, the mechanical energy at any point before reaching the surface of the Earth is equivalent to:

- (A) Kinetic energy alone. (B) Potential energy alone.
(C) Kinetic energy - potential energy. (D) Potential Energy + Kinetic energy

(15) All of the following quantities have a value of zero, except for:

- (A) The kinetic energy of an object at the point it is dropped.
(B) The potential energy of an object when it reaches the ground.
(C) The speed of an object at its maximum height.
(D) The mechanical energy of an object at the moment it reaches the Earth surface.

(16) In the opposite figure: The mechanical energy of the ball is:

- (A) The minimum at position 1
- (B) The maximum at position 2.
- (C) The minimum at position 3.
- (D) Constant at any position.



3. Complete the following statements with appropriate words:

- (1) A fruit on a branch stores which is transformed into when it falls.
- (2) The kinetic energy of an object increases by increasing either or
- (3) The mass of an object is measured in a unit of while the speed is measured in a unit of.....
- (4) At maximum height the mechanical energy of an object is equal to the energy only.
While it is equal to the energy only at the moment of reaching ground level.
- (5) When an object falls vertically downwards, the potential energy decreases and theenergy increases.
- (6) In the midpoint of the vertical distance between the dropping point and the Earth's surface the of the object equals.....
- (7) In the opposite figure the illustrated lever lifting a weight (x)
 - 1-The weight(x) known as and is used for
 - 2- The weight(x) stores..... energy which is converted into when it is released.



4. Put a (✓) or (X) with correction:

- (1) The unit of measurement of kinetic energy is the Newton.
- (2) The kinetic energy of an object increases with increasing its mass and decreasing its velocity.
- (3) The kinetic energy of a stationary object equals zero.
- (4) The kinetic energy of an object doubles when its speed doubles.
- (5) When an object is thrown vertically upwards, its potential energy increases and its kinetic energy decreases.
- (6) The speed of a pendulum's ball is zero when passing the rest position.
- (7) The potential energy of an object at its maximum height equals the kinetic energy at the moment it reaches the Earth's surface.
- (8) The potential energy of water stored behind the High Dam is converted to electrical energy when the water rushes downwards.

5-What do we mean by:

- (1) The kinetic energy of an object is equal to 100 J.
- (2) The kinetic energy of an object with a mass of 10kg equals zero.
- (3) The mechanical energy of a moving object is equal to 500 J.

6-State the mathematical relation between

- (1) The kinetic energy of an object and its mass.
- (2) The kinetic energy of an object and its speed.

(3) The mechanical energy of an object, its potential energy and its kinetic energy.

7-Give reason for the following:

- (1) The kinetic energy of a truck is greater than the kinetic energy of a car when they move at the same speed.
- (2) The work needed to move a car increases when its mass increases.
- (3) The kinetic energy of an object increases during its fall despite its mass remaining constant.
- (4) The kinetic energy of a pendulum's ball is maximum when it passes through the resting position.
- (5) At the maximum height reached by an object thrown upwards, its mechanical energy equals its potential energy.
- (6) The mechanical energy of a falling object remains constant despite its potential energy decreasing.
- (7) The kinetic energy of an object can not be greater than its mechanical energy.
- (8) The High Dam has an important role in generating electricity in Egypt.
- (9) A wrecking (demolition) ball is an example of energy conversion .

8-What happens in the following

- (1) The mass of a moving object is decrease to half, while its speed remains constant (with respect to its kinetic energy).
- (2) The speed of a moving object doubles, while its mass remains constant (with respect to its kinetic energy).
- (3) A pendulum's ball is pulled upwards from its rest position, and then released (with respect to the speed of the ball).
- (4) A pendulum's ball reaches the highest point during its movement (with respect to its kinetic and potential energies).
- (5) A pendulum's ball passes through its rest position during its movement (with respect to its kinetic and potential energies).
- (6) An object is dropped from a height (with respect to its potential and kinetic energies).





Unit (3) Environment and Genetics

Lesson (1) Nutritional Relationships in Biological Communities



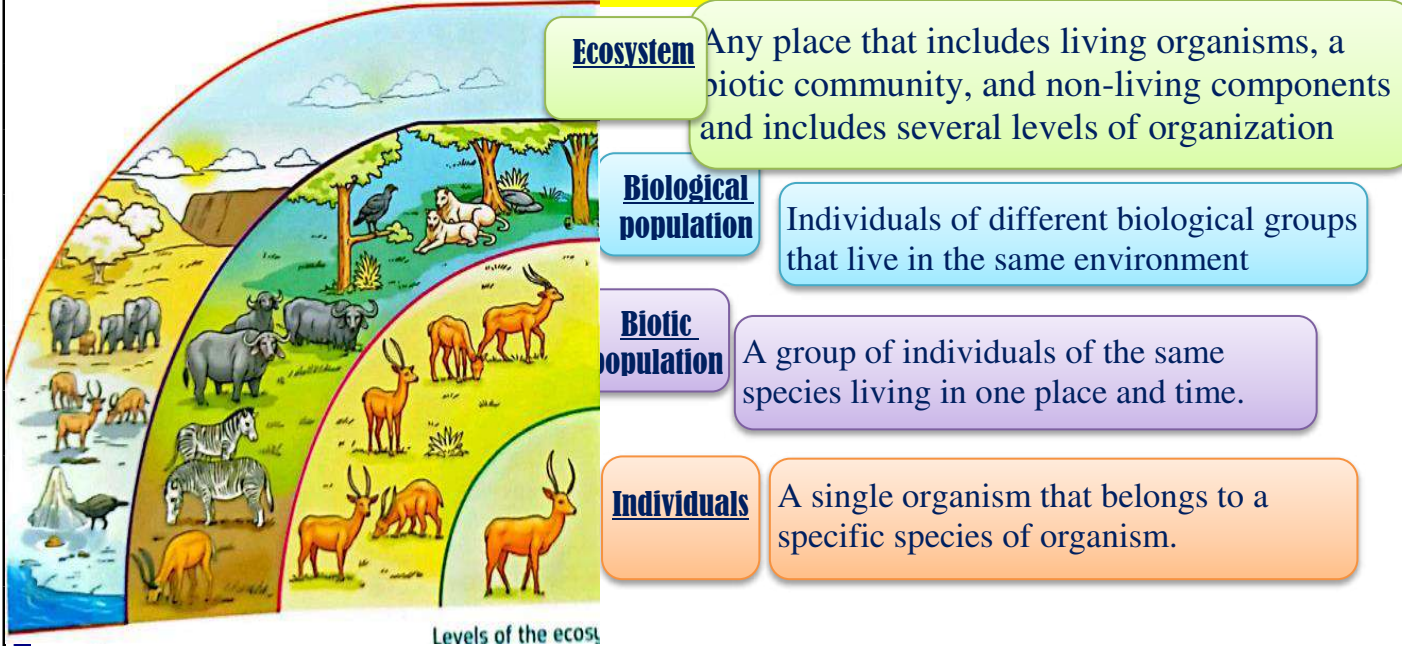
Ecosystem It consists of

<u>Living organisms (biotic)</u>			<u>Non-living components (Abiotic)</u>		
Plants	Animals	Birds	Water	Air	Soil

The ecosystem includes several levels of organization starting from the individual belonging to one of the living organism



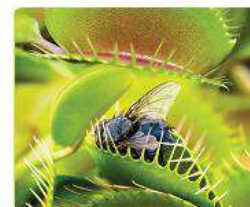
Species The basic unit of classification of living organisms.



Patterns of Nutritional Interactions Among Individuals of Biological Communities



Communities



أنماط التفاعلات الغذائية بين أفراد المجتمعات الحيوية

Patterns of food relationships.

Predation
الافتراس

Competition
المنافسة

Mutualism
التكافل

Commensalism
التعايش

1-Predation is a feeding relationship between two individuals in which one (the predator) benefits and the other (the prey) harmed.

Lion preying on a **zebra**



Lion predator (benefits)
zebra prey (harmed)

Tiger chameleon preys on **insects**



chameleon predator (benefits)
insects prey (harmed)

Dionea plant preys on an **insect**



Dionea predator (benefits)
insect prey (harmed)

2-Competition relationship between two individuals. For a resource, which is found in small quantities, such as food.

علاقة تنافس بين فردين على مورد موجود بكميات قليلة مثل الغذاء -2

Competition A natural relationship between two individuals of the same species for a food resource that is available in small quantities,

..التنافس المنافسة علاقة طبيعية بين فردين من نفس النوع للحصول على مصدر غذائي متوفر بكميات صغيرة،

Example: Competition between two lions In order to get food zebra)

Competition between two lions cause harmed both of them

مثال: المنافسة بين أسدين من أجل الحصول على الغذاء (الحمار الوحشي

المنافسة بين أسدين تتسبب في إيذاء كليهما

What happens when?

Decreasing the food sources for members of the same biotic population.

Competition between them increases, which affects their numbers.

ماذا يحدث عندما؟ نقص مصادر الغذاء لأعضاء نفس المجموعة الأحيائية زيادة المنافسة بينهم، مما يؤثر على أعدادهم

3-Mutualism natural relationship between two individuals in which both them benefit from each other without harming either.

التكافل علاقة بين فردين يستفيد كل منهما من الآخر دون أن يضر أحدهما الآخر

Example of a Mutualism relationship:

The nutritional relationship between bees and plant flowers

Bees benefit from absorbing nectar from flowers,

the plant benefits by transferring pollen on the bodies of bees from one flower to another, which helps in completing the process of floral reproduction to form a new plant.

مثال على علاقة التكافل الغذائية بين النحل وأزهار النباتات يستفيد النحل من امتصاص الرحيق من الأزهار، يستفيد النبات من نقل حبوب اللقاح على أجسام النحل من زهرة إلى أخرى، مما يساعد في إتمام عملية التكاثر الزهري لتكوين نبات جديد



4-Commensalism relationship between two individuals, from which one of them (the commensal) benefits, while the other neither benefits nor is harmed the other individual (the host).

علاقة التعايش بين فردين يستفيد منهما أحدهما (المتعايش) بينما لا يستفيد الآخر ولا يتضرر منه (المضيف)



The symbiont The individual who benefits from the relationship.

المتكافل الفرد المستفيد من العلاقة

Host An individual who neither benefits nor harm in the relationship.

المضيف الفرد الذي لا يستفيد ولا يضر في العلاقة

The crocodile does not benefit from its relationship with the plover?

Because it can live without cleaning its teeth from food scraps.

لا يستفيد التمساح من علاقته بالزقراق لأنه يستطيع العيش دون تنظيف أسنانه من بقايا الطعام

**Predation
relationship**



**Commensalism
relationship**

Living organisms within any biological community are classified into:

Producing organisms
كائنات منتجة

Consumers
كائنات مستهلكة

Decomposers
كائنات محللة

1-Producing organisms كائنات منتجة

Autotrophs are organisms that can make their own food .

Through the process of photosynthesis

Like plants. Algae

كائنات ذاتية التغذية هي الكائنات الحية التي تستطيع صنع غذائها بنفسها من خلال عملية البناء الضوئي مثل النباتات. الطحالب

2-Consumers organisms Heterotrophs are organisms that depend on other producers for their food, directly or indirectly.

كائنات مستهلكة. كائنات غير ذاتية التغذية هي الكائنات الحية التي تعتمد على منتجين آخرين في غذائها، بشكل مباشر أو غير مباشر

Consumer organisms are classified into:

Herbivores اكلات عشب	Carnivores اكلات لحوم	Omnivorous متنوعة الغذاء (قارطة)	Scavengers حيوانات كاسحة
It feeds only on plants . Most of them have incisors for cutting plants.	It feeds only on meat . Most of them have sharp canins for tearing apart prey.	It feeds on both plants and animals (meat).	. It feeds on the remains of dead organisms.
Like a horse - a rabbit مثل الحصان والارنب	Like a Lion - snake مثل الأسد والثعبان	Like a bear - raven - mouse - hedgehog. الدب، الغراب، الفأر والقنفذ	like Hyenas Eagles Cockroaches مثل الضباع والنسور والصراصير



3- Decomposers organisms

كائنات محللة

Organisms that obtain their food from the bodies of dead organisms.

like Bacteria - Fungi

G.R. Why Decomposers are known by this name?

لماذا سميت الكائنات المحللة بهذا الاسم؟

Because it decomposes the organic materials into simple materials that mix with the soil and become part of its components.

لأنها تحلل المواد العضوية إلى مواد بسيطة تختلط بالتربة وتصبح جزءاً من مكوناتها.

The flow of energy between living organisms تدفق الطاقة بين الكائنات الحية

All living things need energy to survive. تحتاج جميع الكائنات الحية إلى الطاقة للبقاء على قيد الحياة.

Producers get their energy from the sun which is the main source of energy on the Earth, then part of this energy is transferred to other living organisms in different paths that include several levels, including:

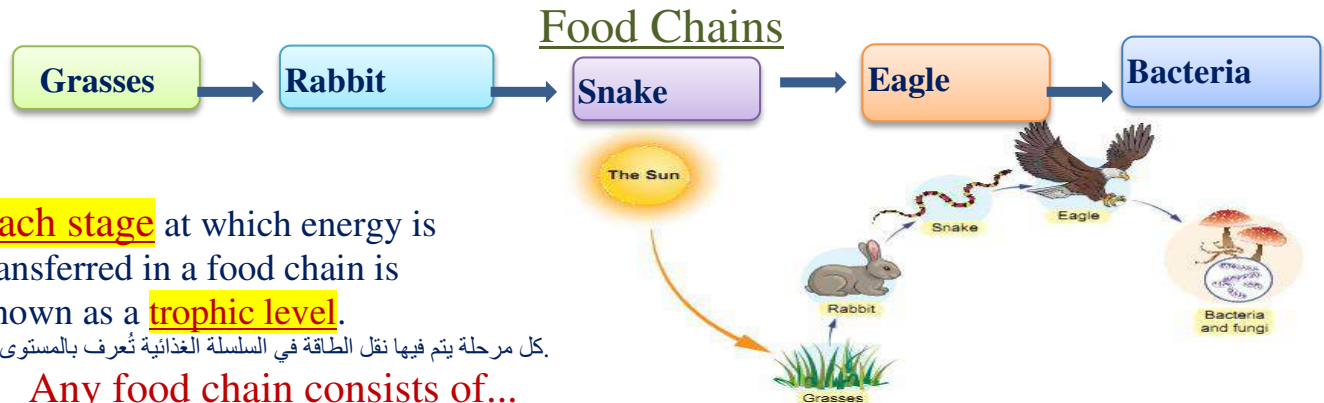
، حيث تحصل الكائنات المنتجة على طاقتها من الشمس التي تعد المصدر الرئيسي للطاقة على الأرض، ثم ينتقل جزء من هذه الطاقة إلى الكائنات الحية الأخرى في مسارات مختلفة تشمل عدة مستويات، منها:

Firstly Food chains secondly Food webs

أولاً السلاسل الغذائية ثانياً الشبكات الغذائية

Firstly Food chains A food chain shows the relationship between organisms in terms of nutrition (who feeds on whom).

Food chain The path of energy transfer in the form of food when it moves from one living organism to another within an ecosystem.



Each stage at which energy is transferred in a food chain is known as a trophic level.

كل مرحلة يتم فيها نقل الطاقة في السلسلة الغذائية تُعرف بالمستوى الغذائي.

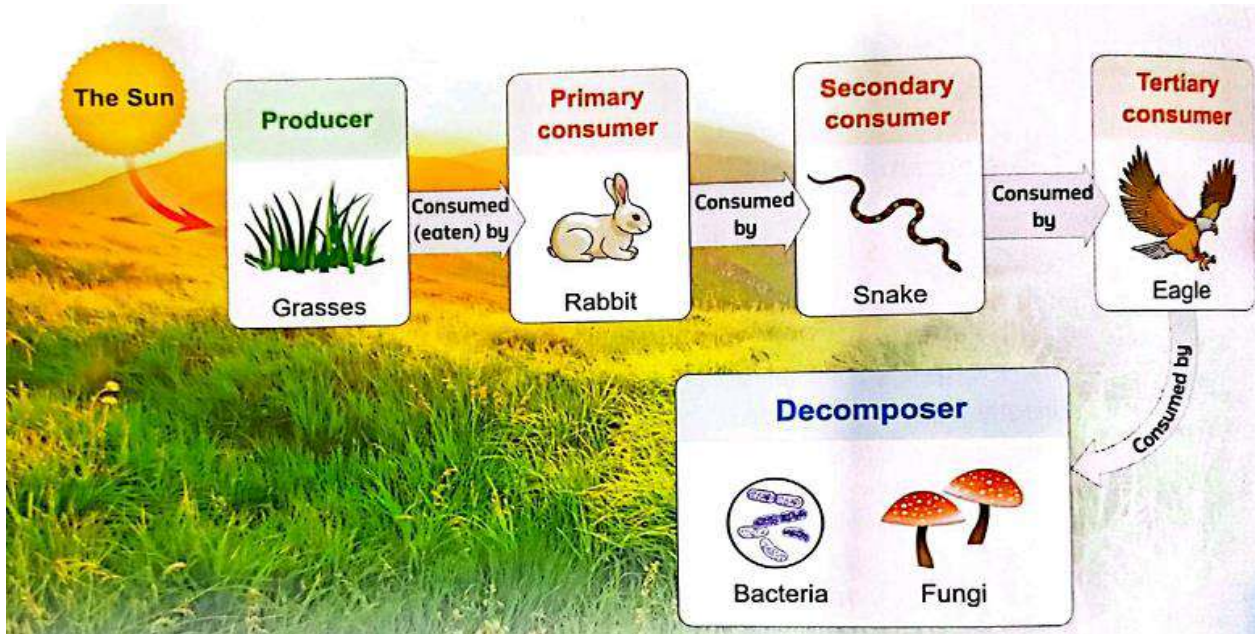
Any food chain consists of...

<u>1-Producer organisms</u>	<u>2-Consumers organisms</u>	<u>3- Decomposers organisms</u>
كائنات منتجة	كائنات مستهلكة	كائنات محللة
first trophic level	trophic levels higher than the first level	It gets its energy from any trophic level.



Food chains are classified into:

1-Terrestrial food chain	2-Equatic food chain	3- Desert food chain
--------------------------	----------------------	----------------------

1- Terrestrial food chain

G.R. Grass are autotrophic organisms... Explain?

Because it produces its own food through photosynthesis.

G.R. Insect are First consumer organisms... Explain?

First / because it feeds on producing organisms.

The snake is a secondary consumer (second-order)?

Consumer because it gets energy from feeding on the mouse.

Secondary / because it feeds on herbivores (primary consumer).

G.R. The eagle is a tertiary consumer...

Consumer / because it gets energy from feeding on the snake.

Tertiary / because it feeds on secondary consumers.

G.R. Bacteria and fungi are decomposers...

Because it decomposes the organic materials found in the bodies of organisms after their death into simple materials

2-Equatic food chain

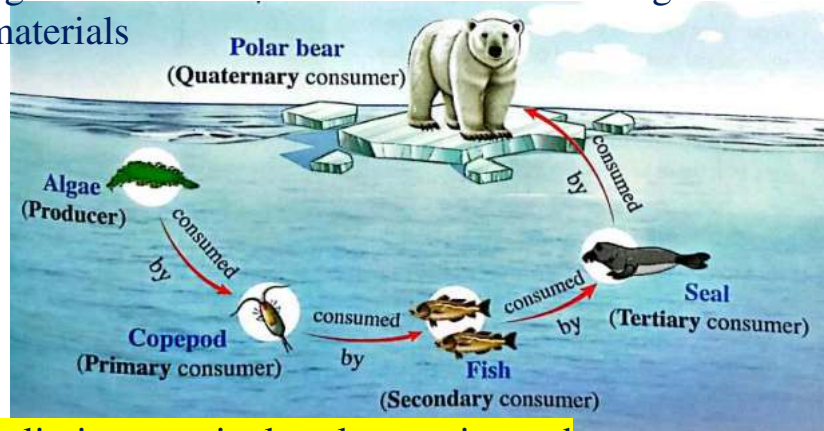
Algae	crustaceans
small fish	large fish
polar bear	bacteria

المكافحة البيولوجية

Biological control.

Living organisms are used to eliminate agricultural pests instead of using pesticides.

يتم استخدام الكائنات الحية للقضاء على الآفات الزراعية بدلاً من استخدام المبيدات الحشرية.



For example: using **ladybugs** to **feed on aphids**, which are agricultural pests that infect vegetables and fruits.

على سبيل المثال: استخدام الخنافس للتغذية على المن، وهي الآفات الزراعية التي تصيب الخضروات والفواكه.

Secondly Food webs ثانياً شبكات الغذاء

Overlap and interconnectedness of several food chains

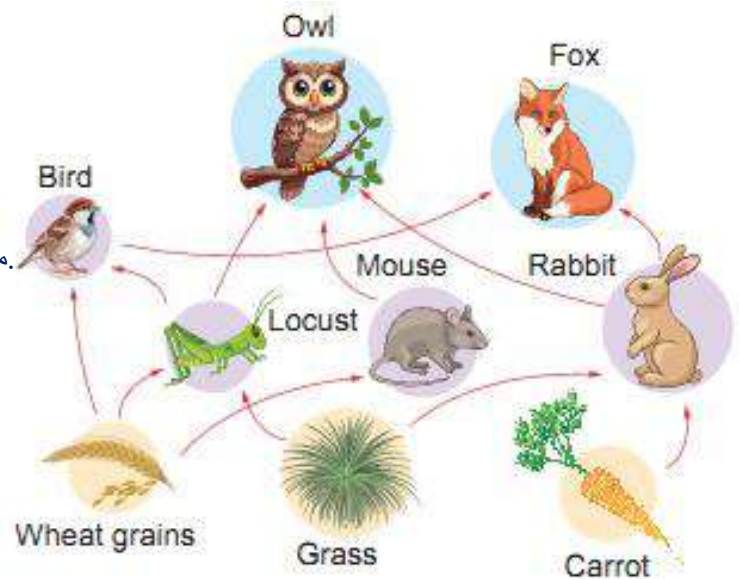
تداخل وترابط العديد من السلاسل الغذائية

G.R. It is rare to find single food chains in ecosystems... Why?

من النادر أن نجد سلاسل غذائية واحدة في النظم البيئية... لماذا؟

Because one organism can feed on more than one source at the same time a source of nutrition for many other organisms at higher trophic levels.

لأن الكائن الحي الواحد يستطيع أن يتغذى على أكثر من مصدر في نفس الوقت، وهو مصدر تغذية لكثير من الكائنات الحية الأخرى في مستويات غذائية أعلى.



The bird:

► Is considered a primary consumer in food chain (1)

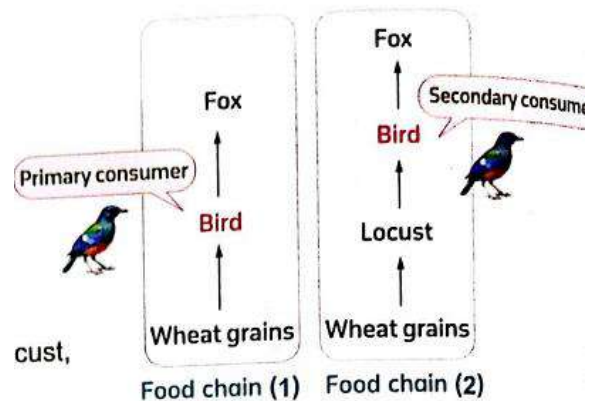
► Is considered a secondary consumer in food chain (2)

Primary consume

► In the food chain

It is a predator, as it feeds on the locust,

and a prey, as the fox feeds on it.

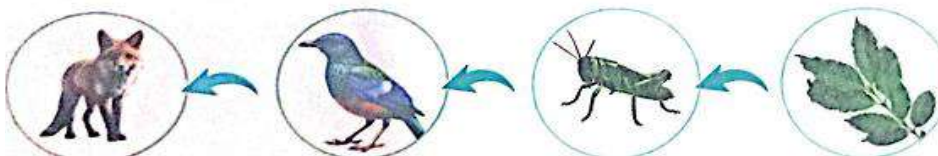


Environmental balance

The absence of one of the organisms present in an ecosystem in equilibrium affects the rest of the members of the food chain or food web.

What is the effect of bird migration on the numbers of each?

<u>Locust</u>	<u>Foxes</u>
Locust numbers are increasing	Fox numbers are decreasing
Due to the small number of predators	Due to the small number of prey



Energy pyramid

A pyramid that represents the path of energy and its quantities between different trophic levels in any food chain.

هرم الطاقة

هرم يمثل مسار الطاقة وكمياتها بين المستويات الغذائية المختلفة في أي سلسلة غذائية.

The base of the pyramid is occupied by the producers, while the top of the pyramid is occupied by the consumers at the end of the food chain.

يحتل المنتج قاعدة الهرم، بينما يحتل المستهلك في نهاية السلسلة الغذائية قمة الهرم.

Only 10% of the energy of the producer organism is transferred to the primary consumer.

10% فقط من طاقة الكائن المنتج تنتقل إلى المستهلك الأولي.

It is clear from the food chain shown in the figure opposite that:

يتضح من السلسلة الغذائية الموضحة في الشكل المقابل أن:

Only 10% of the primary consumer's energy is transferred to the secondary consumer.

10% فقط من طاقة المستهلك الأولي تنتقل إلى المستهلك الثانوي.

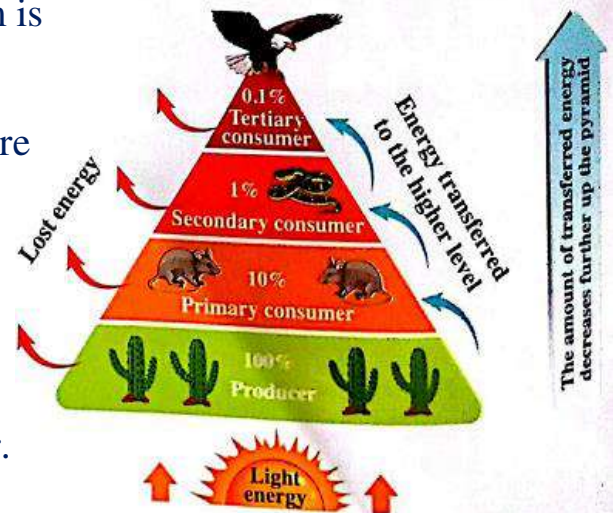
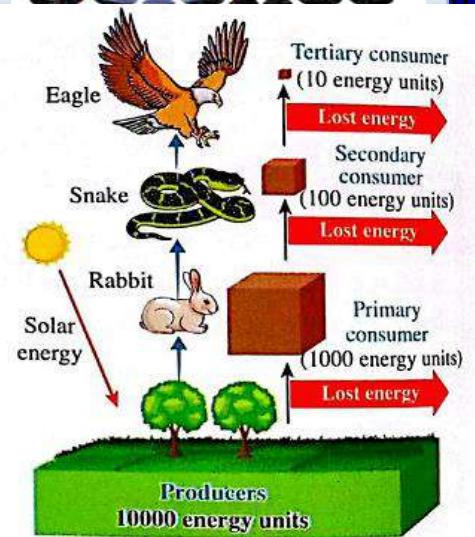
Only 10% of the energy from the secondary consumer is transferred to the tertiary consumer.

10% فقط من طاقة المستهلك الثانوي تنتقل إلى المستهلك الثالث.

In general: Only 10% of the energy is transferred from one trophic level to the next in the energy pyramid.

بشكل عام: 10% فقط من الطاقة تنتقل من مستوى غذائي إلى المستوى التالي في هرم الطاقة.

That is, it is: 90% of energy is lost when moving from one trophic level to the next. أي أن: 90% من الطاقة تضيع عند الانتقال من مستوى غذائي إلى المستوى التالي.



Lesson one

1. Write the scientific term

From Ecosystem to Pre-Energy Flow Between Organisms

- (1) Any place that includes living organisms and non-living (abiotic) components and includes several levels of organization. (.....)
- (2) The fundamental unit in the classification of the living organisms. (.....)
- (3) The various biotic populations of different species that inhabit the same environment(.....)
- (4) A group of individuals of the same species living in a particular place at the same time. (.....)
- (5) A nutritional relationship between two individuals where one of them benefits, while the other individual is harmed or loses its life. (.....)
- (6) A nutritional relationship between two individuals of the same species for a food source that exists in limited quantities. (.....)
- (7) A nutritional relationship between two individuals where both of them benefit from each other without causing harm to either of them. (.....)
- (8) A nutritional relationship between two individuals known as the commensal and the host (9) A nutritional relationship between two individuals, one of them benefits and the other neither benefits nor is harmed. (.....)
- (10) Autotrophic organisms that can make their own food through the photosynthesis process. (.....)
- (11) Animals that depend on the producers to obtain their food. (.....)
- (12) Consumers that feed on plants and animals. (.....)
- (13) Consumers that feed on the remains of dead organisms. (.....)
- (14) Organisms that obtain energy from the breaking down of the organic substances found in dead bodies. (.....)

From energy flow between living organisms

- (15) The path of energy transfer in the form of food when it is transferred from one living organism to another within the ecosystem. (.....)
- (16) Each stage in which energy is transferred in the food chain. (.....)
- (17) A method in which utilisation of living organisms through food systems to eliminate agricultural pests instead of using pesticides. (.....)
- (18) The interconnection and overlapping of multiple food chains together(.....)
- (19) A pyramid represents the flow of energy and its amounts between different trophic levels in any food chain(.....)

2-Choose the correct answer from the given answers

From the Ecosystem to the Pre-Energy Flow Between Living Organisms

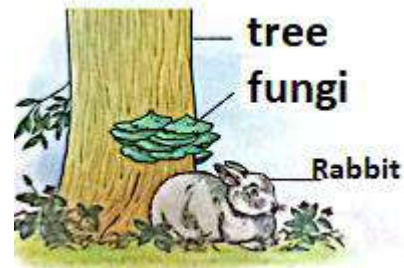
(1) Which of the following is true?

- a. A community is a group of individuals of the same species living in the same space.
- b. An ecosystem is the interaction of a living community with its surrounding environment.
- c. A population is a group of individuals of different species living together.
- d. A species is a group of different individuals living in a community.

(2) From the opposite figure:

Tree, mushroom and rabbit form.....

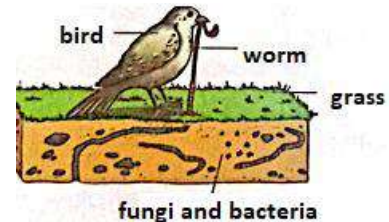
- a. Omnivorous organisms.
- b. Herbivorous creatures.
- c. Vital group.
- d. A lively community.



(3) The opposite figure: shows several living organisms. different people live in a particular area.

The worms in this environment represent

- a. A lively community.
- b. ecosystem.
- c. a biotic population .
- d. biosphere



(4) Food relationships that result in harm to both individuals.

- a. Predation
- b. Commensalism
- c. Mutualism
- d. Competition

(5) Each of the following relationships represents a predatory relationship, except.

- a. Lion and zebra.
- b. Dionea plant and insect.
- c. Nile crocodile and plover. الزقراق
- d. Wolf and Rabbit.

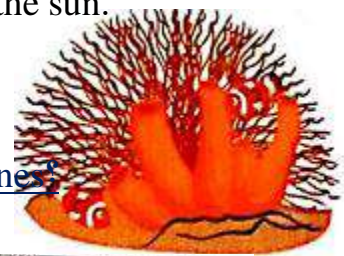
(6) Predators of the same species that live in the same ecosystem.

- a. They become analyzed objects.
- b. Compete for food تتنافس
- c. It produces its own food
- d. It gets its energy from the sun.

(7) The opposite figure shows a clownfish cleaning an anemone the anemone is scavenging for waste while hiding in it from enemies.

What kind of relationship is there between clownfish and anemone?

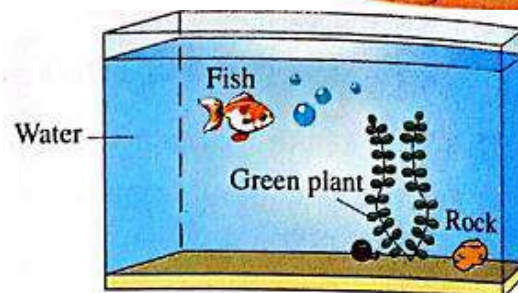
- a. Commensalism
- b Mutualism
- c. Competition
- d. Predation



(8) From the opposite figure:

What is the consumer in the aquarium ?

- a. Water.
- b. Green plant
- c. The fish.
- d. The rock.



(9) Herbivorous organisms from.....

- a. The producer.
- b. Scavengers
- c. consumers
- d. decomposers

(10) Living organisms that obtain their food from plants and animals.

- a. Eagles and hyenas
- b. The snake and the cow.
- c. Rabbit and mouse
- d. The hedgehog and the bear.

(11) Animal (X) feeds on small animals and plant roots, so it is described as an organism.

- a. Omnivorous
- b. Scavengers
- c. Rodents
- d. decomposers

(12) From the livings that feed on the corpses of bodies of dead livings

- a. Hyenas.
- b. Fungi
- c. Cockroaches
- d. Foxes

From energy flow between living organisms

(13) Decomposers in food chains perform the process of

- a. Food manufacturing by photosynthesis.
- b. Recycle nutrients to the ecosystem.
- c. Absorbing energy from the sun.
- d. Production of new foodstuffs.

(14) The main source of energy on the Earth's surface is...

- a. Producers b. Plants c. The sun d. Consumers

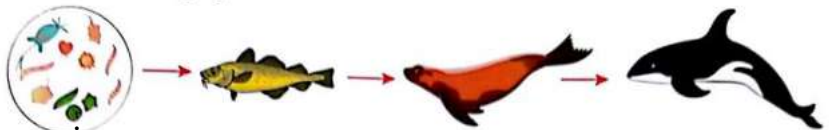
(15) Which of the following indicates the correct path of energy in a food chain?

- a. Grass - Cow - Human - The sun b. Sun -- Grass -- Cow -- Human
c. Human - Cow - Grass -- Sun d. Cow - Grass- Sun - Human

(16) From the following figure:

What does the arrow represent?

- a. Path of energy flow.
b. Increasing numbers of living organisms.
c. Replacing one community with another.
d. Decreasing food sources.



(17) Which of the following obtains energy from the other three types?

- a. Producers b. Decomposers c. Carnivores d. Herbivorous

(18) Which of the following food chains contains producers, consumers, and decomposers, respectively?

- a. Rat – Hawk – Grass b. Plant - locust - bacteria.
c. Butterfly - plant – owl d. Fungi - tiger - tree

(19) Which of the following represents the following food web?

Producers

Living (2)

Living (3)

- a. The Living (2) is a carnivore. b. The Living (2) secondary consumer
c. The Living (3) is a carnivore. d. The Living (3) is a tertiary consumer.

(20) In the corresponding food chain:

plants

insect

bird

Hawk

Which of the following is true?

- a. The hawk is a consumer and the plant is a producer.
b. The hawk is a consumer and the insect is a predator.
c. The insect is a predator and the bird is a herbivore.
d. The insect is a predator and the plant is a producer.

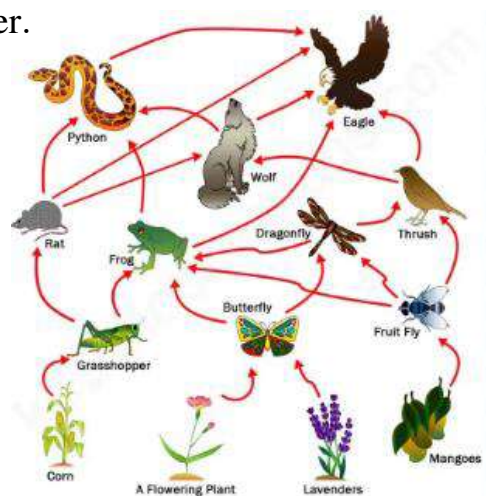
(21) In the food web shown in the figure opposite:

1- Energy is transferred from

- a. Hawk – Rat – Locust - Grass
b. Grass - Cockroaches – Hawk- frog
c. Locust- Cockroaches- Hawk – Snake
d. Grass - Cockroaches – Rat – Hawk

2- Which of these organisms is considered both prey and predator at the same time?

- a. Cockroaches b. locust.
c. Frog. d. Hawk



(22) In the corresponding food chain:

Corn seeds

young chicken

Mouse

Snake

Owls

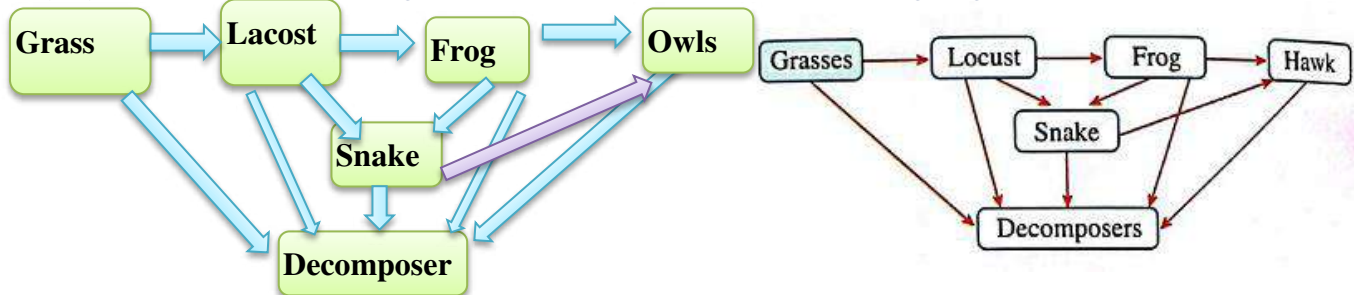
1-Getting rid of the Owls leads to.

- a. Maintaining environmental balance. b. Increase in snake numbers.
c. Increased numbers of mice. d. Decrease in numbers of young chickens.

2- How many consumer organisms are there in this chain?

- a. 2 b. 3 c. 4 d. 5

(23) In the corresponding food web: which of the following organisms?

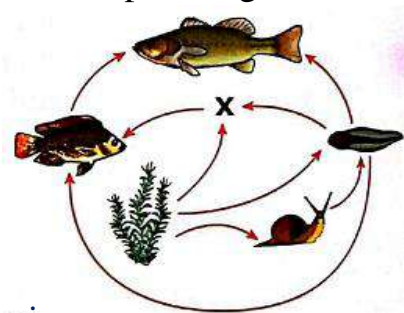


Do you get energy from the same food source?

- a. Locust snakes. B. hawks Frog. c. frogs snakes d. Decomposers, grass

(24) In the food web shown in the figure opposite (X) represents a living organism:

- a. Herbivore.
b. Carnivores
c. Omnivores
d. The producer.



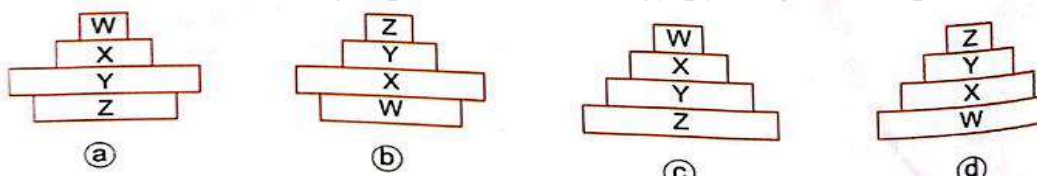
(25) The base of the energy pyramid is occupied by organisms.

- a. producer. b. Primary consumer. c. Tertiary consumer d. decomposers

(26) The opposite diagram represents a food chain:



Which of the following represents the energy pyramid that represents this series?



(27) The opposite figure: represents an energy pyramid in which energy is derived Level (A) its energy

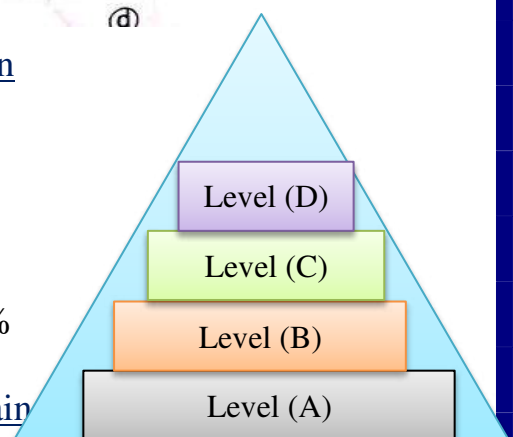
- a. Producers. b. living Level B
c. The Sun. B. living Level B

(28) The amount of energy lost when moving from any level to the next level in the energy pyramid is equal to:

- a. 1% b. 10% c. 90 % d. 100%

(29) If the energy of the producer organism in a food chain energy of the secondary consumer is equal to..... units of energy

- a. 1000 b. 100. c. 10 . d. 0.1 .



3- Complete the following sentences with the appropriate word:

From the Ecosystem to the Pre-Energy Flow Between Living Organisms

(1) Any ecosystem consists of..... Each of them consists of biotic communities which consist of.....

(2) The opposite figure represent the relationship betweenwhich is cat

And which is mouse.



(3) The relationship between bees and plant flowers is a The relationship between the Dionea plant and the insect is a..... relationship.

(4) The plant benefits from the flower by transporting.....from one flower to another to complete the..... process.

(5) The opposite figure represents a relationship between a gazelle and a bird.



1-The relationship is known as.....

2-The individual who benefits from this relationship is..... And is called.....

3-The individual who neither benefits nor is harmed by this relationship is..... It is called.....

(6)organism Autotrophs, while organism heterotrophs.

(7) Most herbivores have to cut plants, while most carnivores have to tear apart prey

(8) Fungi are consideredorganisms while herbivores

The flow of energy between living organisms

(9) The food chain begins with anorganism. like..... while it ends withorganism Like bacteria.

(10) Producers obtain energy from....., while organisms get their energy from the producing organisms.

4- correct the underline

(1)The individual that is harmed by a predatory relationship is known as the host.

(2) Both individuals are harmed from the Commensalism relationship

(3)The Commensality neither benefits nor suffers any harm in the cohabitation relationship.

(4) Grasses and herbs produce their food through the process of respiration.

(5) Carnivorous animals feed on the remains of dead organisms.

(6) Predators convert waste and dead organisms into simple materials that mix with the soil.

(7) In the absence of consumer organisms, the remains of dead organisms accumulate in the environment.

(8) Oxygen is transferred between organisms in food chains.



5-Put (✓) and (x), and correct the wrong:

From the Ecosystem to the Pre-Energy Flow Between Living Organisms

- (1) A biosphere is a collection of living organisms and non-living materials found in a specific area. ()
- (2) The nutritional relationship between the lion and the tiger is a predator-prey relationship. ()
- (3) Bees only benefit from the relationship between bees and plant flowers. ()
- (4) Only the host benefits in a commensal relationship with another organism. ()
- (5) The only living organism that produces its own food is the animal. ()
- (6) Fungi and bacteria decompose organic matter in living organisms into simple substances that mix with the soil. ()

The flow of energy between living organisms

- (7) The primary consumer is always a herbivore. ()
- (8) The food chain consists of several interconnected food webs. ()
- (9) Energy is transferred from consumer organisms to producer organisms in the food web. ()
- (10) The number of rabbits in a community increases when there are few predators. ()
- (11) of the energy in the energy pyramid is transferred from one trophic level to the next. ()

6-Give one example for each of the following:

- (1) Predatory relationship
- (2) Competitive relationship
- (3) Mutualism relationship.
- (4) Commensalism relationship.
- (5) Producer .
- (6) Consumer.
- (7) Herbivorous animal.
- (8) Carnivorous animal.
- (9) omnivorous animal
- (10) Scavengers
- (11) Decomposers .
- (12) Biological control.



7-Determine the type of relationship between each two of the following organisms:

- (1) The lion and the zebra.
- (2) The tiger's horn and the insect.
- (3) Dionea plant and insect.
- (4) The plover and the crocodile
- (5) Bees and plant flowers.
- (6) Ladybug and aphid



8-Give reasons for the following:

From Ecosystem to Pre-Energy Flow Between Living Organisms

(1) The nutritional relationship between the lion and the zebra is a predatory relationship.

.....

(2) The nutritional relationship between the plover and the crocodile is a commensal relationship.

.....

(3) Producers are autotrophs, while consumers are heterotrophs.

.....

(4) The horse's jaw has incisors, while the lion's jaw has sharp fangs.

.....

(5) The bear and the crow are continental creatures.

.....

(6) Naming the decomposers by this name.

.....

The flow of energy between living things

(7) Producers are located at the first trophic level in any food chain.

.....

(8) The importance of studying food chains in biological control.

.....

(9) Spotted beetles play an important role in protecting vegetables and fruits from agricultural pests.

.....

(10) A single food chain is rare in ecosystems.

.....

(11) Energy transfer when it moves from one living organism to another in the energy pyramid.

.....



Lesson Two

Genetic Traits and Mutations



Lesson (2)

Genetic Traits and Mutations

All living organisms are characterized by a set of characteristics and behaviors that can be classified into

<u>Hereditary traits</u> الصفات الوراثية	<u>acquired traits</u> الصفات المكتسبة	<u>Instinctive behaviors</u> السلوكيات الغريزية
Traits that are <u>transmitted</u> from parents to children <u>without learning</u> and are inherited from one generation to the next	Traits that are <u>not inherited</u> from parents to offspring but are <u>acquired</u> from the surrounding environment through <u>learning</u> or <u>training</u> , and do <u>not transmitted</u> from one generation to another	Behaviors and skills that are <u>transmitted</u> from parents to offspring <u>without learning</u>
The human hair color	A child learning to walk	A bat sleeping upside down
The eye colour	Building strong muscles of a sports champion	Chicken laying on eggs
The short legs of the Arctic fox	A dolphin playing with a ball	A squirrel breaking hazelnut shell
The length of giraffe's neck	Learning languages	The spider weaving its web to catch insects
The presence of a hard skeleton covering the turtle's body	The horse jumping over obstacles	The bird building its nest

Question Classify the following into genetic traits, acquired traits, and instinctive behaviors

Reading and writing Acquired traits

Facial freckles Genetic traits

Curly hair Genetic traits

Breastfeeding Instinctive behavior

Chromosomes and the transmission of genetic traits

All living organisms perform a series of vital processes. Including reproduction

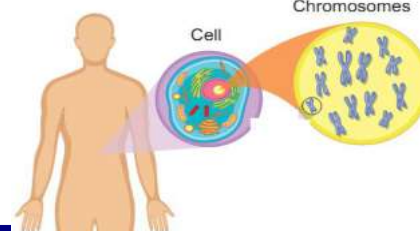
Reproduction A vital process aims to produce new individuals (offspring) that resemble their parents

التكاثر عملية حيوية تهدف إلى إنتاج أفراد جدد (نسل) يشبهون آبائهم

Genetic traits are transmitted from parents to offspring through genetic material known as chromosomes

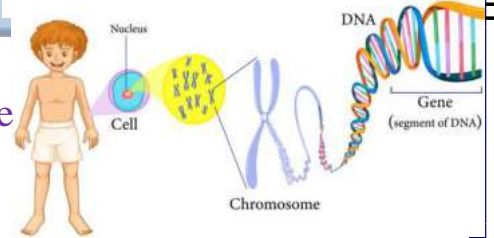
The genetic material (chromosomes) is found in

- The nuclei of the eukaryotes-
- The cytoplasm of the prokaryotes-



Chromosomes Thread-like bodies that represent the genetic material of the eukaryotic organisms, which are responsible for the transmission of genetic traits from parents to offspring

الكروموسومات أجسام تشبه الخيوط تمثل المادة الوراثية للكائنات حقيقية النواة، وهي المسؤولة عن نقل الصفات الوراثية من الآباء إلى الأبناء



Individuals of the same species have the same number of chromosomes in each of their somatic cells, such as liver and skin cells

الأفراد من نفس النوع لديهم نفس عدد الكروموسومات في كل من نداءاتهم الجسدية، مثل خلايا الكبد والجلد

The number of chromosomes varies from one organism to another, as

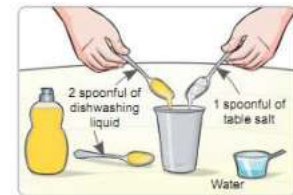
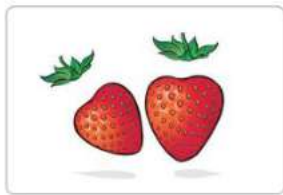
Living organism	Human	Bee	Corn plant
Number of chromosomes	46	32	20

An individual inherits half of its chromosomes from the **father** and the other half from the **mother**

Illustrates the possibility of separating the chromosomes present in the cells of living organism

Used materials and tools -Strawberries - Self-sealing plastic bags - Plastic cup
 ½ cup of water -2 spoonful's of dishwashing liquid - 1 spoonful of table salt
 -Coffee filter paper Ethyl alcohol - toothpick

Steps



1-Separate the green leaves from the strawberries

2-Put the fruits inside the plastic bag and mash them by hand

3-Prepare a mixture for separating the chromosomes using the dishwashing liquid and table salt with water in the plastic cup



4- Add the previously prepared mixture to the mashed strawberries

5- Repeat the mashing process slowly to avoid the formation of bubbles inside the bag

6- Filter the mixture found in the bag using the coffee filter paper



7-Add an equal volume of ethyl alcohol to the resulting filtrate on the inner wall of the cup without shaking or stirring

8- Wait a few seconds... What do you observe? What is the substance we can be separated by using the toothpick?

Observation and Conclusion

White threads that are separated on the surface of the filtrate are the chromosomes of the strawberry cells



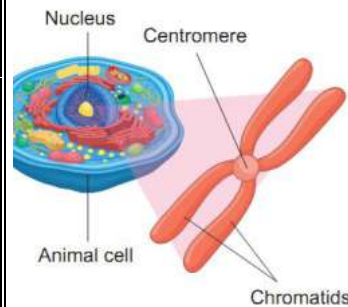
Structure of chromosomes

General composition

التركيب العام

Each chromosome consists of two threads, each called a chromatid, the two chromatids are connected at a central point known as the centromere

يتكون كل كروموسوم من خيطين، يُسمى كل منهما كروماتيد، ويرتبط الكروماتيدان عند نقطة مركزية تُعرف باسم السنترومير



Chemical composition

التركيب الكيميائي

The chromosomes chemically composes of nucleic acid as DNA wrapped around a type of protein known as histones

تتكون الكروموسومات كيميائيًا من الأحماض النووية على شكل DNA ملفوف حول نوع من البروتين يُعرف باسم الهستونات

Centromere السنترومير

The central point at which the two chromatids of the chromosome are connected

النقطة المركزية التي يرتبط عندها كروماتيدي الكروموسوم

Chemical structure of DNA

The nucleic acid DNA is made up of small segments called genes

التركيب الكيميائي للحمض النووي DNA يتكون الحمض النووي DNA من أجزاء صغيرة تسمى الجينات

Gene

Segments of the nucleic acid DNA found in chromosomes, they are responsible for the appearance of the hereditary traits in the living organism

الجينات أجزاء الحمض النووي DNA الموجودة في الكروموسومات، وهي المسؤولة عن ظهور الصفات الوراثية في الكائن الحي.

Chemical structure of nucleic acid

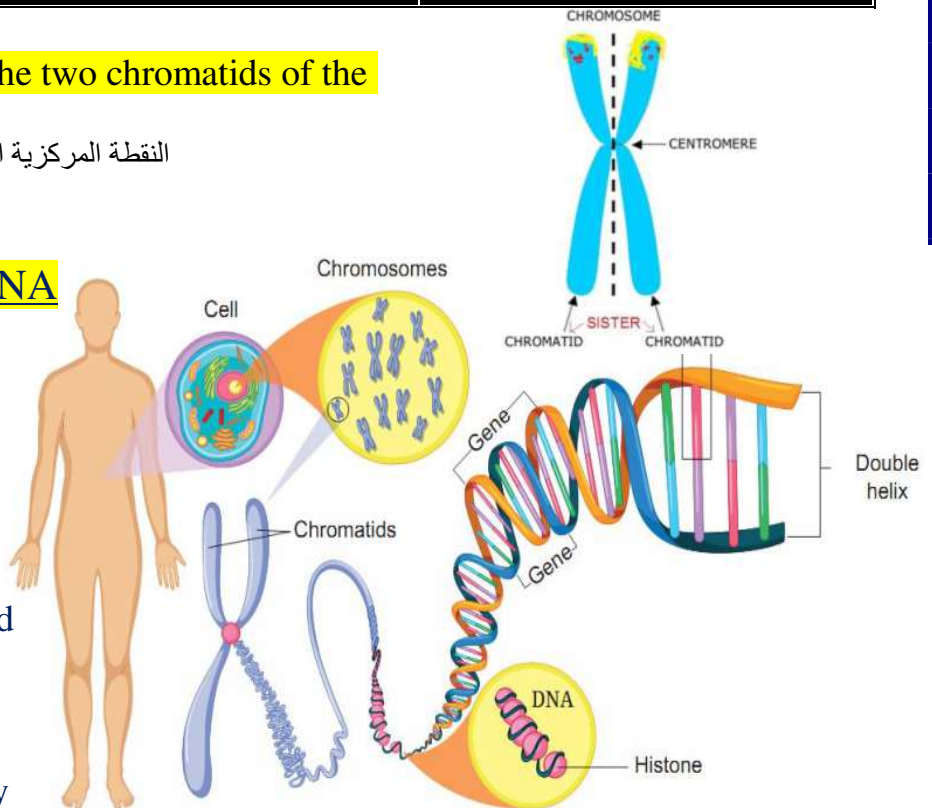


Figure (21) Chemical structure of the chromosome

Each gene consists of a sequence of smaller building units known as nucleotides, which exist in the form of two strands twisted around each other, forming what is known as the double helix

Nucleotide The smallest building unit of the nucleic acid DNA

A single chromosome carries thousands or millions of genes, the number of which varies from one chromosome to another within the cells of the same individual. The previous information can be summarized in the following diagram

The cell in eukaryotes

The role of genes in expression of hereditary traits

دور الجينات في التعبير عن الصفات الوراثية

Hereditary traits are transmitted (passed) from parents to offspring through genes, where an individual inherits half of his genetic material from the father and the other half from the mother

تنتقل الصفات الوراثية من الآباء إلى الأبناء عن طريق الجينات، حيث يرث الفرد نصف مادته الوراثية من الأب والنصف الآخر من الأم.

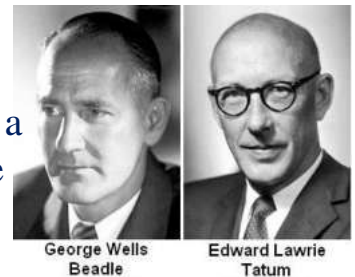
Genetics The science that studies the transmission of genetic traits from parents to offspring. العلم الذي يدرس انتقال الصفات الوراثية من الآباء إلى الأبناء.

Gregor Mendel is considered the **founder** of the **science of genetics**

يعتبر جريجور مندل مؤسس علم الوراثة.

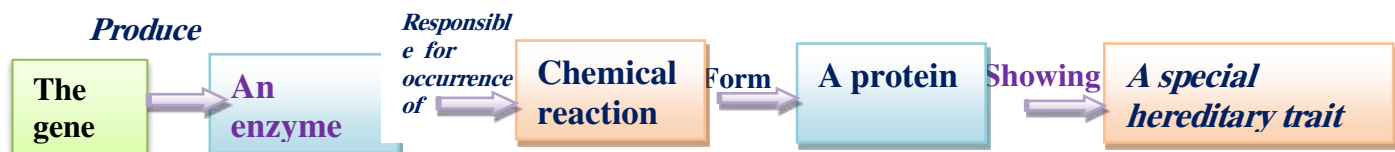
The scientists Beadle and Tatum affirmed the **one gene-one enzyme hypothesis** through their experiments

One gene one enzyme hypothesis (each **gene** produces a specific **enzyme**, this **enzyme** is responsible for the occurrence of a **chemical reaction**, that leads to the formation of a **protein** that expresses a **specific hereditary trait**)



وقد أكد العالمان بيدل وتاتوم من خلال تجاربهما **فرضية الجين الواحد والإنزيم الواحد**.
فرضية الجين الواحد والإنزيم الواحد تنص على أن كل جين ينتج إنزيمًا محددًا، وهذا الإنزيم مسؤول عن حدوث تفاعل كيميائي يؤدي إلى تكوين بروتين يعبر عن صفة وراثية محددة.

The following diagram illustrates the mechanism of the gene action



Application The inheritance of curly hair trait تطبيق وراثية صفة الشعر المجعد

When an individual inherits the gene responsible for the appearance of the curly hair trait from one of their parents, this gene produces a specific enzyme that is responsible for a chemical reaction, that forms the protein which expresses the curly hair trait

عندما يرث الفرد الجين المسؤول عن ظهور صفة الشعر المجعد من أحد والديه، فإن هذا الجين ينتج إنزيمًا محددًا مسؤولاً عن تفاعل كيميائي، يشكل البروتين الذي يعبر عن صفة الشعر المجعد



What is the result of The difference in the arrangement of the nucleotides on DNA The genes present on a single chromosome differ, leading to the difference in the hereditary trait that each gene is responsible for expressing

ما هي نتيجة اختلاف ترتيب النيوكليوتيدات على الحمض النووي تختلف الجينات الموجودة على الكروموسوم الواحد، مما يؤدي إلى اختلاف الصفة الوراثية التي يكون كل جين مسؤولاً عن التعبير عنها.

الطفرات **Mutations**

A change may occur in the nature of gene, such as a change in the arrangement of the nucleotides that compose it, leading to a change in the hereditary trait that this gene is responsible for and hence the emergence of a new trait that did not previously exist, these changes are known as mutations

قد يحدث تغير في طبيعة الجين، مثل تغير ترتيب النيوكليوتيدات المكونة له، مما يؤدي إلى تغير في الصفة الوراثية التي يكون هذا الجين مسؤولاً عنها وبالتالي ظهور صفات وراثية جديدة لم تكن موجودة من قبل، وتُعرف هذه التغيرات بالطفرات

Mutation The emergence of a new hereditary trait that did not previously exist, as a result of a change in the nature of the gene responsible for it

الطفرة ظهور صفات وراثية جديدة لم تكن موجودة من قبل، نتيجة تغير طبيعة الجين المسؤول عنها.

Examples of mutations أمثلة على الطفرات

The creation of huge types of cows

نشأة أنواع ضخمة من الأبقار

.The birth of an individual with a six fingers on hand

ولادة فرد بستة أصابع في يده

**Types of mutations**

mutations vary according to several factors, as illustrated in the following diagram

Types of mutations			
According to			
The origin		The impact	
Spontaneous mutations	Induced mutations	Harmful mutations	Beneficial mutations

Types of mutations according to the origin

<u>Spontaneous mutations</u> الطفرات التلقائية	<u>Induced mutations</u> الطفرات المستحثة
Mutations that occur naturally without human intervention الطفرات التي تحدث بشكل طبيعي دون تدخل بشري	Mutations that occur through human intervention الطفرات التي تحدث من خلال التدخل البشري
A <u>dark-skinned mother</u> giving birth to an <u>albino child</u> , this mutation is known as albino mutation (albinism) أم ذات بشرة داكنة تلد طفلاً مهيأً، تُعرف هذه الطفرة باسم طفرة المهق (البهاق)	Production of <u>featherless chickens</u> to <u>reduce the electrical energy</u> used in air conditioning in farms in hot regions إنتاج دجاج بدون ريش لتقليل الطاقة الكهربائية المستخدمة في تكييف الهواء في المزارع في المناطق الحارة
	

Harmful mutations

الطفرات الضارة

Mutations that cause the appearance of new undesirable traits, some of them may lead to death

الطفرات التي تسبب ظهور صفات جديدة غير مرغوبة، بعضها يؤدي إلى الموت

Examples of harmful mutations

Spinal deformity (curved spine)

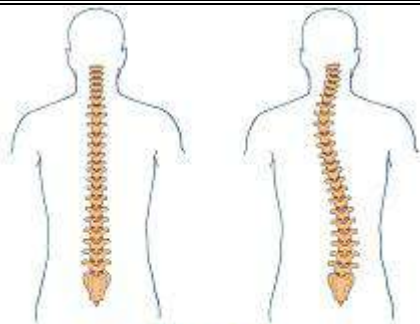


Figure (33)

Normal
spineDeformed
(curved) spine

Among the lethal mutations is the severe muscular dystrophy (wasting and weakness of the muscles) in certain newborns

ومن بين الطفرات القاتلة هو ضمور العضلات الشديد (هزال وضعف العضلات) في بعض الأطفال حديثي الولادة

Beneficial mutations

الطفرات المفيدة

Mutations that cause the appearance of new desirable traits, whether occurring naturally or through human intervention

الطفرات التي تسبب ظهور سمات مرغوبة جديدة، سواء حدثت بشكل طبيعي أو من خلال التدخل البشري.

Examples of naturally occurring (spontaneous) beneficial mutations

The change in the skin colour to adapt to the environment, such as Light skin colour in individuals living in cold countries which helps them to absorb vitamin D better

أمثلة على الطفرات المفيدة التي تحدث بشكل طبيعي (عفوي) التغير في لون الجلد للتكيف مع البيئة، مثل لون البشرة الفاتح لدى الأفراد الذين يعيشون في البلدان الباردة مما يساعدهم على امتصاص فيتامين د بشكل أفضل..

Examples of induced beneficial mutations

1-Production of seedless fruits



2-Production of wheat plants resistant to wheat rust disease



Integration with Agricultural Science التكامل مع العلوم الزراعية
the production of **cubic-shaped watermelons** is considered agricultural **technique not a mutation**, this is achieved by acing the watermelon in a square mold during its growth, using it to take the shape of the .mold to facilitate their transportation



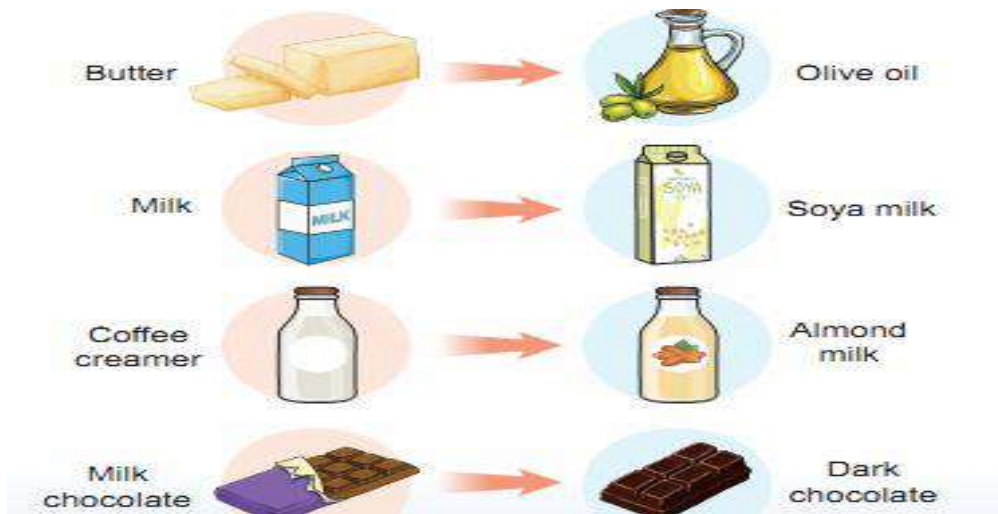
إن إنتاج البطيخ المكعب الشكل يعتبر تقنية زراعية وليست طفرة، ويتم ذلك من خلال وضع البطيخ في قالب مربع أثناء نموه، واستخدامه ليأخذ شكل القالب لتسهيل نقله.

Life Application

The mutation of lactose tolerance, which allows lactose sugar found in milk and dairy products such as cheese and yogurt to be converted into simpler sugars that are easier for the body to absorb, is a natural mutation (beneficial spontaneous mutation). Individuals who suffer from lactose intolerance feel crampy, nausea and other painful symptoms when drinking .milk or eating dairy products

They can avoid milk and dairy products by using dairy alternatives t cause these symptoms, as illustrated in the following figure: Cubic-shaped watermelon

طفرة تحمل اللاكتوز، التي تسمح بتحويل سكر اللاكتوز الموجود في الحليب ومنتجات الألبان مثل الجبن والزبادي إلى سكريات أبسط يسهل على الجسم امتصاصها، هي طفرة طبيعية (طفرة عفوية مفيدة). يشعر الأفراد الذين يعانون من عدم تحمل اللاكتوز بتقلصات و غثيان وأعراض مؤلمة أخرى عند شرب الحليب أو تناول منتجات الألبان. يمكنهم تجنب الحليب ومنتجات الألبان باستخدام بدائل الألبان التي تسبب هذه الأعراض، كما هو موضح في الشكل التالي



Lesson two1. Write the scientific term

- (1) Traits that are inherited from one generation to the next(.....)
- (2) Traits that are not inherited from parents to offspring the surrounding environment through learning or training (.....)
- (3) Behaviors and skills that are transmitting from parents to offspring without learning (.....)
- (4) A vital process aims to produce new individual resembling their parents (.....)
- (5) Thread-like bodies representing the genetic materials of the eukaryotic organism (.....)
- (6) The central point at which the two chromatids of the chromosomes are connected (.....)
- (7) Segments of the nucleic acid DNA found in chromosomes they are responsible for the appearance of the hereditary traits in the living organism (.....)
- (8) The smallest building unit of the nucleic acid DINA
- (9) The science that studies the transmission of genetic traits from parents to offspring (.....)
- (10) Each gene produces a specific enzyme responsible for occurrence of chemical reaction that leads to the formation of a protein that expresses a specie hereditary trait (.....)
- (11) The emergence of a new hereditary trait that did not pre of a change in the nature of the gene responsible for it(.....)
- (12) Mutations that occur naturally without human intervention. (.....)
- (13) Mutations that occur through human intervention(.....)
- (14) Mutations that cause the appearance of new undesirable traits, some of them may lead to death (.....)
- (15) Mutations that cause the appearance of new desirable trails, whether occurring naturally or through human intervention(.....)

2-Choose the correct answer:

- (1) Which off the following is inherited by a child from their parents? إتقان اللغة الفرنسية
 - a. Driving a car b. Strong muscles. c. Curly hair d. Proficiency in French
- (2) The spider weaving its web is considered
 - a. a spontaneous mutation. b. an acquired trait
 - c. a genetic trait d. an instinctive behavior السلوك الغريزي
- (3) Which of the following is an acquired trait?
 - a. Facial freckles b. A dolphin playing with a ball
 - c. A squirrel breaking hazelnut shell d. A chicken laying on the eggs.
- (4) The number of chromosomes in corn plant cells equals
 - a. 20 b. 26 . c. 32 d. 46

(5) The central point at which the two chromatids of the chromosome are connected is called.....

- a) the nucleotide (b) the centrosome. c) The gene. (d) The centromere

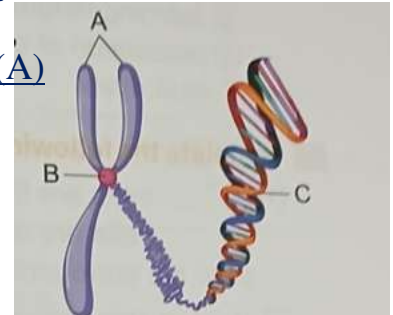
(6) Histones are.....

- a. enzymes b. proteins c. fats d) carbohydrates

(7) From the opposite figure

Which of the following represents each of (A), (B) and (C)? (A)

Choices	(A)	(B)	(C)
(a)	Chromosome	Nucleotide	DNA
(b)	DNA	Centromere	Nucleotide
(c)	DNA	Nucleotide	Gene
(d)	Chromatids	Centromere	DNA



(8) The gene consists of a sequence of

- a. chromosomes (b) chromatids c. Nucleotide d) proteins

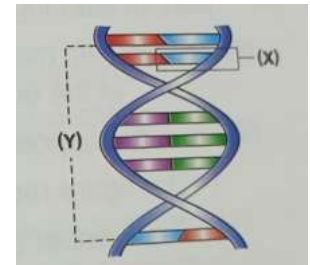
(9) From the opposite figure

1. The part referred to by the letter (X) is a

- a. chromatid. (b) chromosome.
c. histone d. nucleotides

2- Which of the following statements is correct about the part referred to by the letter (Y)?

- a. The smallest building unit of the nucleic acid DNA
b. Responsible for the appearance of a hereditary trait of the living organism.
c. A type of protein.
d. Absent in prokaryotes.



(10) The genetic material that found in cells and determine hereditary traits of the living organism is called

- a. PNA (b) NAD c. AND d) DNA

(11) The two scientists who affirmed the hypothesis of one gene - one enzyme through their experiments are

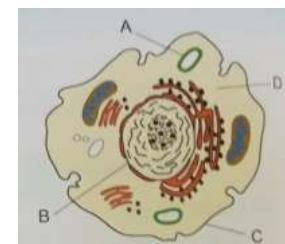
- a. Beadle and Crick. b. Mendel and Tatum
c. Beadle and Tatum. d. Watson and Crick.

(12) Genes control the appearance of hereditary traits in the living organism by producing

- a. hormones. (b) enzymes. c. chromosomes. d. vitamins.

(13) From the opposite figure of the cell The genetic material that the cell uses it in the production of various proteins is found in

- a. (A) b. (B)
c. (C) d. (D)



(14) From the induced mutations is

- a. production of wheat plants resistant to wheat rust disease b. learning languages
c. production of cubic-shaped watermelons. d. blue eyes.

3-Complete the following statements:

(1)traits are transmitted from parents to offspring without learning, whiletraits are not inherited from one generation to the next and are learned from the surrounding environment.

(2) Human skin color is a (an)trait, while building strong muscles is atrait

(3) Among the behaviours and skills that are transmitted from parents to offspring without learning are and.....

(4) The genetic material is found inof the eukaryotes, while it is found inof the prokaryotes,

(5) From the opposite figure:

1- The figure represents

2- The number (1) refers to while the number (2) refers to.....

(6) The number of chromosomes in human skin cell is chromosomes while that in bee cell is. chromosomes,

(7) A chromosome is chemically composed of a nucleic acid called twisted around a protein known as

(8) is a part of the nucleic acid DNA that consists of a sequence of smaller building units called.....

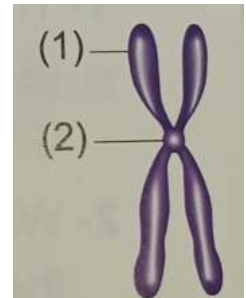
(9) The scientist Mendel concluded from his experiments that each hereditary traits controlled by a pair ofwhich were later known as.....

(10) The scientistsand succeeded in discovering the role of the gene in appearance of hereditary traits.

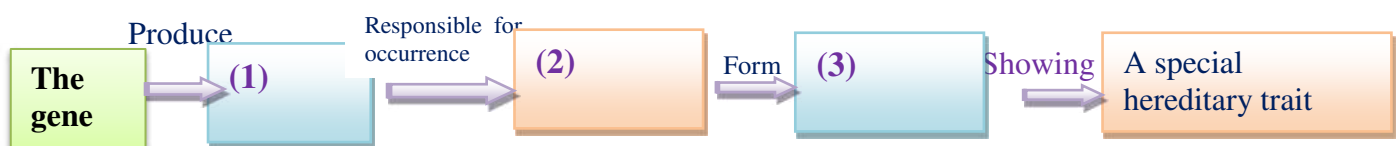
(11) Each gene produces a specific..... responsible for the occurrence of aleads to the formation of a..... that expresses a specific hereditary trait

(12) An albino child is an example of..... mutation while the production of seedless fruits ismutation.,

(13)mutation may lead to death, while mutation is a beneficial mutation that occurs spontaneously



4-complete the following diagrams:



5-Correct the underlined words:

(1) Chromosomes are circular bodies in eukaryotic organisms.

(2) Genetic material is found in the cytoplasm of the eukaryotes.

(3) The scientist Tatum is considered the founder of genetics.

(4) The gene produces a specific protein that is responsible for occurrence of a specific chemical reaction.

(5) The production of featherless chickens from the lethal mutations.

(6) The production of cubic-shaped watermelons is an induced mutation.

6-Mark(√) or (X) for each statement, with correction:

- (1) The presence of a hard skeleton covering the turtle's body is an acquired trait ()
- (2) Instinctive behaviours are transmitted from one generation to the next through learning and training. ()
- (3) Individuals of the same species have different number of chromosomes present in their somatic cells. ()
- (4) Chromosomes are small segments of the nucleic acid DNA ()
- (5) A single chromosome carries thousands or millions of genes. ()
- (6) An individual inherits half of his genetic material from the father and the other half from the mother. ()
- (7) A change in the arrangement of the nucleotides on DNA leads to a change in the hereditary traits. ()
- (8) A change in the nature of the gene leads to a change in the hereditary trait which responsible for it and the appearance of a new hereditary trait. ()
- (9) Human controls the occurrence of spontaneous mutations. ()
- (10) Light skin color in individuals living in cold countries is considered a harmful induced mutation. ()
- (11) Individuals who suffer from lactose intolerance can alternate olive oil by butter ()

7-Give one example for each of the following

- | | | |
|----------------------|----------------------|-------------------------|
| 1-General trait | (2) Acquired trait | 3) Instinctive behavior |
| (4) Spontaneous | (5) Induced mutation | (6) Beneficial mutation |
| (7) Harmful mutation | (8) Lethal mutation | |

8-Give reasons of each of the following

- 1- The eye color is a genetic trait, white a dis
.....
2. Both chicken laying on eggs and seeping of bats upside down are instinctive behaviours
.....
- (3) The nucleic acid DNA is known as the double helix
.....
- (4) DNA is the source off genetic information for living organism
.....
- (5) Mendel is considered the founder of the genetics science
.....
- (6) Genes control the appearance of an individual's genetic traits
.....
- (7)The enzymes produced by genes play an important role in the appearance of an individual's genetic traits
.....
- (8) Genetic traits vary based on the difference in the arrangement of nucleotides on DNA
.....

(9) The birth of a dark-skinned mother to an albino child is a spontaneous mutation

(10) The production of featherless chickens is a beneficial indicat mutation

(11) The light skin color in individuals living in cold countries beneficial spontaneous mutation

(12) The production of cubic-shaped watermelons is an agriculture considered a mutation

(13) The mutation of lactose tolerance is a beneficial mutation

9-What are the results of each of the following

- (1) The formation of a specific enzyme by a gene
- (2) Variation in the arrangement of nucleotides on DNA
- (3) Change in the nature off a specific gene
- (4) Severe muscular dystrophy in some newborn infants
- (5) Placing the watermelons in a square molts during is growth
- (6) A person suffering from lactose intolerance eats a piece of milk chocolate



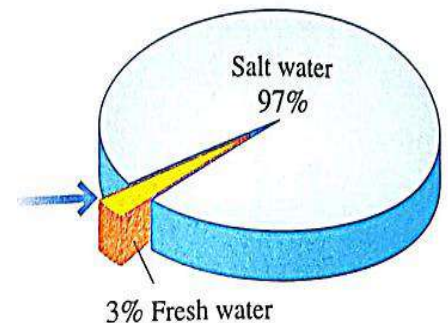
Unit (4) Natural cycle

Lesson (1) Water cycle



Water:

- water in the human body that forms approximately 70%
- Water in the Earth's surface about 71%



Water is used for drinking, agriculture, industry and sanitation, and it has a vital role in regulating the temperature of the Earth planet

- Water exists in the **three states** of matter:
Solid, liquid and gas

Fresh water represents only about 3% of the water available on the Earth's surface,

which makes its conservation and prudent use (GR)

for ensuring its sustainability in the future.

(GR) تمثل المياه العذبة حوالي 3% فقط من المياه المتوفرة على سطح الأرض، مما يجعل الحفاظ عليها واستغلالها بحكمة أمراً ضرورياً لضمان استدامتها في المستقبل.

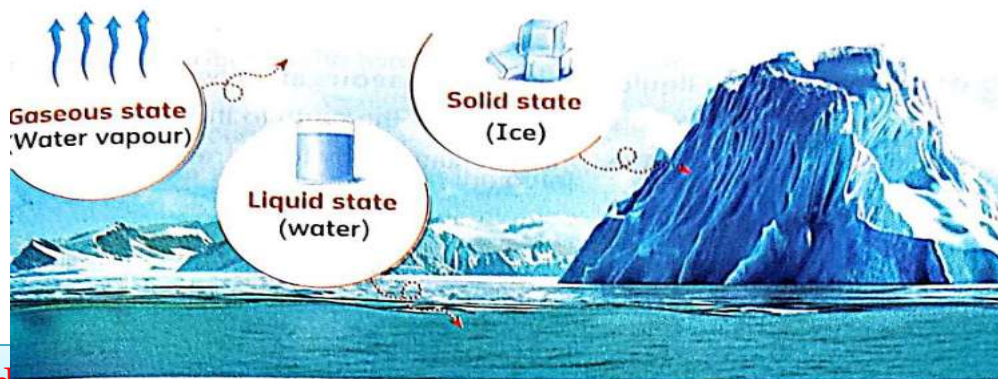
The uses of water are various in different fields, such as تتعدد استخدامات المياه في مجالات مختلفة مثل

Drinking الشرب Agriculture - Sanitation الزراعة الصرف الصحي Hygiene النظافة

Water also plays a vital role in regulating the temperature or the Earth planet

States of Water

Water exists in the three states of matter, which are



States of water in nature

Water converted from one state to another upon gaining or losing heat as demonstrated by the following activities

Activity 1 Conversion of water from the liquid state to the gaseous state

Used tools and materials Two cups of water

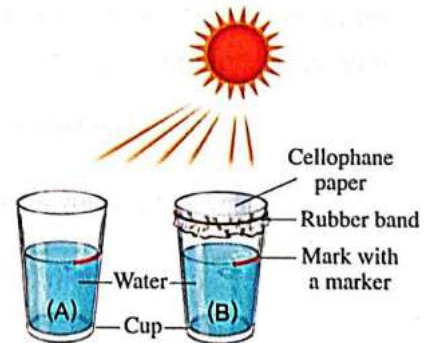
.Rubber band Cellophane paper Marker

Step

1-Use the marker to mark the water level in both cups and label one cup with the letter (A) and the other with the letter (B)

2-Cover the opening of cup (B) with the cellophane paper and secure it with the rubber band

3-Place the two cups in a sunny place for 5 to 6 hours



Observation The amount of water in cup (A) decreases, while the amount of water in cup (B) remains changed

Conclusion

Water is converted from the liquid state to the gaseous state by gaining heat, thereby moving from the surface of the earth water vapour) upon the atmospheric air, in a process known as evaporation, which occurs at any temperature

Evaporation The conversion of water from the liquid state to the gaseous state upon gaining heat at any temperature

التبخر تحول الماء من الحالة السائلة إلى الحالة الغازية عند اكتساب الحرارة عند أي درجة حرارة

A Take care

The rate of evaporation in tropical regions Is faster than in polar regions, due to the fact that sunlight rays in tropical regions are vertical and thus have a greater effect,

إن معدل التبخر في المناطق الاستوائية أسرع منه في المناطق القطبية، وذلك لأن أشعة الشمس في المناطق الاستوائية تكون عمودية وبالتالي يكون تأثيرها أكبر

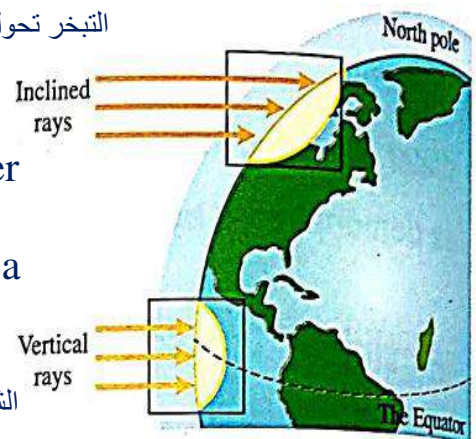
while in polar regions, sunlight rays are Inclined and so their heat is distributed over a larger area,

.resulting in a lesser effect

، بينما في المناطق القطبية تكون أشعة الشمس مائلة وبالتالي تتوزع حرارتها على مساحة أكبر مما يكون تأثيرها أقل.

The boiling point is a characteristic property of pure substance, unlike the evaporation process, as each substance has its own boiling point, while .evaporation occurs at any temperature

نقطة الغليان هي خاصية مميزة للمادة النقية، على عكس عملية التبخر، حيث أن كل مادة لها نقطة غليان خاصة بها، في حين أن التبخر يحدث عند أي درجة حرارة.



Activity 2 Conversion of water from the gaseous state to the liquid stateUsed tools and materials Two cups containing water

Tissues Ice cubes

steps

1-Wipe the outer surface of the two cups with the tissues

2- Place ice cubes in cup (A) only

Compare between what happens on the outer surfaces of the two cups after several minutes

Observation

Water droplets are formed on the outer surface of cup (A) only

Explanation

The decrease in temperature inside the cup (A) lower than the air temperature led to the condensation of water vapour present in the air forming the water droplets on the outer surface of the cold cup

Conclusion Independent variable Water temperature (ice cubes)

النتيجة المتغير المستقل درجة حرارة الماء (مكعبات الثلج)

Dependent variable Formation of water droplets on the surface of cup (A)

المتغير التابع تكون قطرات الماء على سطح الكوب (أ)

Condensation converted Water from the gaseous state to the liquid state upon losing heat when returning from the atmospheric air to the Earth's surface once again, which occurs at any temperature

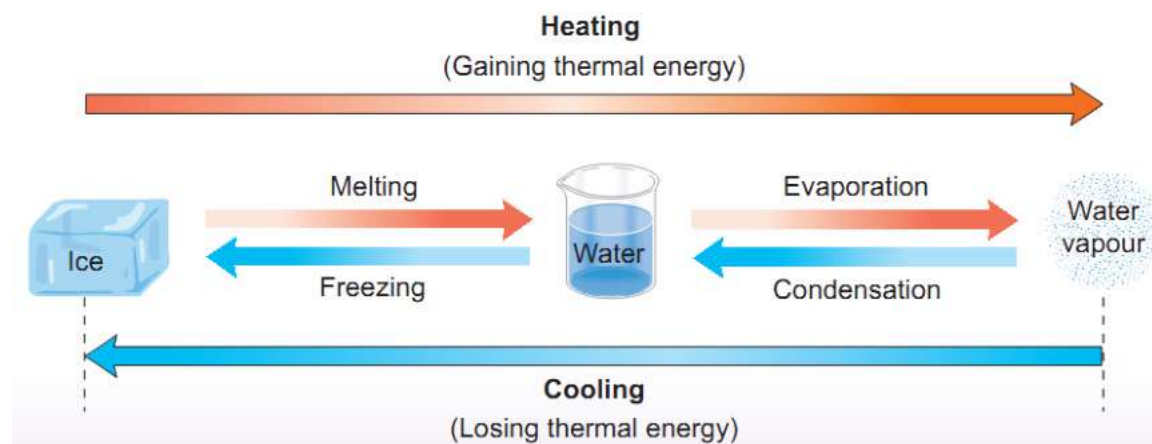
التكاثف يتحول الماء من الحالة الغازية إلى الحالة السائلة عند فقدان الحرارة عند العودة من الهواء الجوي إلى سطح الأرض مرة أخرى، والتي تحدث عند أي درجة حرارة.

Condensation

The conversion of water from the gaseous state to the liquid state upon losing heat at any temperature

The following diagram illustrates the conversions of water with changing the temperature

التكثيف تحويل الماء من الحالة الغازية إلى الحالة السائلة عند فقدان الحرارة عند أي درجة حرارة..



it is clear that:

The melting process is the reverse of the freezing process, while the evaporation process is the reverse of the condensation process

عملية الانصهار هي عكس عملية التجميد، في حين أن عملية التبخر هي عكس عملية التكثيف

The Water Cycle in Nature:

water in water bodies such as oceans, seas, rivers and lakes come from

Activity 3 The Water Cycle in Nature

Used tools and materials - Empty cup - Hot water - Ice cubes

Cellophane paper - Marker - Tissues - Rubber band

Steps

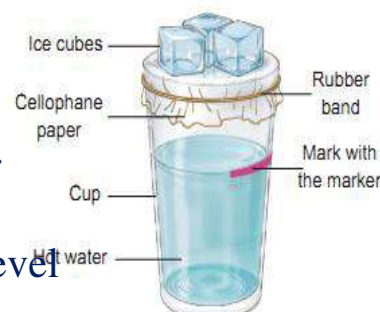
Pour hot water into the cup (figure

2-Wipe the mouth of the cup with the tissues, then cover the mouth of the cup with the cellophane paper

.and secure it with the rubber band

3-Draw a line with the marker to indicate the water level in the cup

4-Place the ice cubes on the surface of the cellophane paper



Observation ملاحظة

.Formation of water droplets on the inner surface of the cellophane paper

.The amount of water in the cup remains unchanged

تكوّن قطرات ماء على السطح الداخلي لورق السيلوفان تبقى كمية الماء في الكأس ثابتة.

Explanation التفسير

The ice cubes have lowered the temperature of the cellophane paper surface, which led to the condensation of the water vapour which evolves from the hot water into water droplets that fall into the cup once again and .then evaporate once more

لقد خفضت مكعبات الثلج درجة حرارة سطح ورق السيلوفان، مما أدى إلى تكاثف بخار الماء الذي يتطور من الماء الساخن إلى قطرات ماء تسقط في الكأس مرة أخرى ثم تتبخر مرة أخرى.

Conclusion الخلاصة

The water in the cup converts into water vapour, which in turn condenses into water droplets in a closed cycle, representing what occurs in nature and is known as the water cycle

يتحول الماء في الكأس إلى بخار ماء، والذي يتكثف بدوره إلى قطرات ماء في دورة مغلقة، تمثل ما يحدث في الطبيعة والمعروف بدورة الماء

The water cycle دورة الماء

A new process involving the movement of water between the atmospheric air and the earth

عملية جديدة تتضمن حركة الماء بين الهواء الجوي والأرض

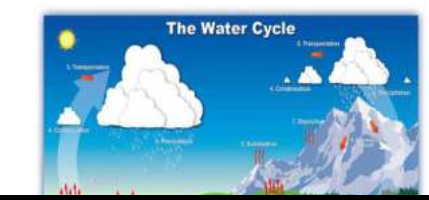
To reduce the amount of the formed water droplets, it is necessary to reduce the difference between the temperature of the water in the beaker and that of

the water in the basin, by lowering the temperature of the water in the .(beaker through adding cooler water to it (its temperature is lower

ولتقليل كمية قطرات الماء المتكونة، من الضروري تقليل الفرق بين درجة حرارة الماء في الكأس ودرجة حرارة الماء في الحوض، وذلك بخفض درجة حرارة الماء في الكأس بإضافة ماء أبرد إليه (درجة حرارته أقل).

Sources of water vapour in nature

Water vapour in nature is formed through the evaporation of water from various sources, such as

<u>The evaporation of water from large water bodies</u>	<u>The process of transpiration in plants</u>	<u>The evaporation of water of perspiration (sweat)</u>
Such as rivers, seas and oceans	<u>Transpiration</u> The process by which plants lose water in the form of water vapour	Which is secreted by human and animals
		

The multiple pathways in the water cycle:

• The water cycle is a natural process that involves the movement of water between the atmosphere and the Earth in a closed, multi-path cycle, as follows:

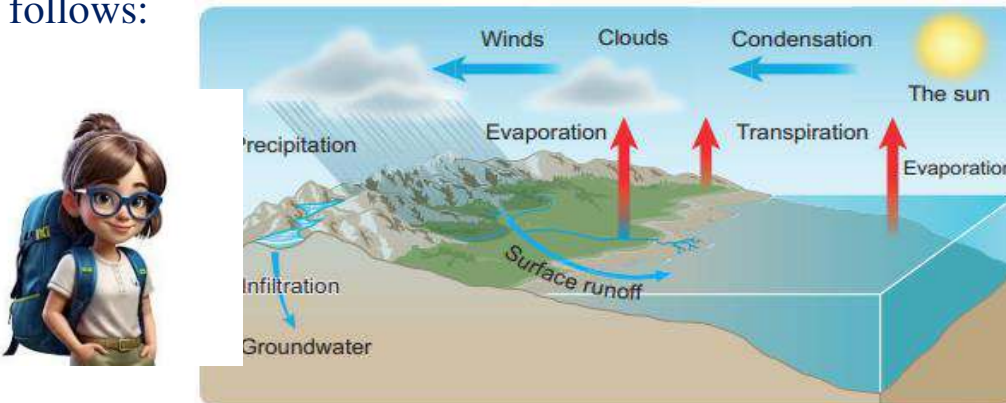


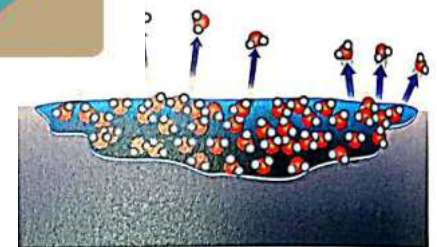
Figure (9) The water cycle

1-Evaporation: Occurs when water on the Earth's surface evaporates due to the energy derived from the sun's heat.

1. التبخر: يحدث عندما يتبخر الماء على سطح الأرض بسبب الطاقة المستمدة من حرارة الشمس.

2-Condensation: Air currents in contact with the Earth's surface carry water vapor to higher altitudes, where it loses energy and its temperature decreases, causing condensation. Minute water droplets gather to form clouds, which are driven by the wind, and more water droplets merge inside them to form larger and heavier droplets.

2. التكاثف: تحمل التيارات الهوائية الملاصقة لسطح الأرض بخار الماء إلى ارتفاعات أعلى، حيث يفقد طاقته وتنخفض درجة حرارته، مما يسبب التكاثف. تتجمع قطرات الماء الدقيقة لتكوين السحب، التي تدفعها الرياح، وتندمج المزيد من قطرات الماء داخلها لتكوين قطرات أكبر وأثقل.



3-Precipitation: Occurs when heavy cloud water droplets fall back to the Earth's surface due to gravity in the form of rain. When cloud temperatures are below freezing, the precipitation occurs in the form of snow rather than rain. Small snow crystals gather together, and during thunder storms, hail falls down to earth.

3. هطول الأمطار: يحدث عندما تسقط قطرات ماء السحب الثقيلة مرة أخرى على سطح الأرض بسبب الجاذبية في شكل مطر. عندما تكون درجات حرارة السحب أقل من درجة التجمد، يحدث هطول الأمطار في شكل ثلج وليس مطرًا. تتجمع بلورات الثلج الصغيرة معًا، وخلال العواصف الرعدية، يسقط البرد على الأرض.

4-Precipitation

The process of water droplets falling from clouds to the Earth's surface in the form of rain, snow, or hail due to gravitational pull

4-التساقط عملية سقوط قطرات الماء من السحب إلى سطح الأرض على شكل مطر أو ثلج أو برد بسبب الجاذبية

5-Surface Runoff

The process of rainwater **flows** on the surface of the earth and into rivers, seas, and lakes due to the Earth's gravity

5-الجريان السطحي

عملية جريان مياه الأمطار على سطح الأرض وإلى الأنهار والبحار والبحيرات بسبب جاذبية الأرض

It is clear from the above that there are two main factors that maintain the continuity of the water cycle in nature, namely:

A-Solar Heat:

Solar heat causes water to move from the Earth to the atmosphere through evaporation.

أ- الحرارة الشمسية:

تتسبب الحرارة الشمسية في انتقال الماء من الأرض إلى الغلاف الجوي من خلال التبخر.

B-Earth's Gravitational Force

The force of gravity helps in returning the water back to the Earth through the process of precipitation, maintaining the balance of the ecosystem.

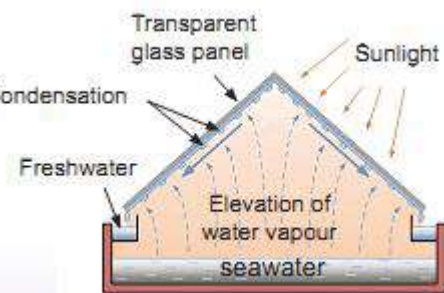
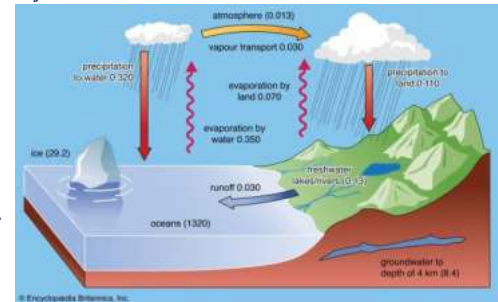
ب- قوة الجاذبية الأرضية

تساعد قوة الجاذبية في إعادة الماء إلى الأرض من خلال عملية الترسيب، مما يحافظ على توازن النظام البيئي.

Life Application

Desalination of seawater is carried out to facing the resources shortages of freshwater suitable for drinking or irrigation, particularly in remote areas. The principle of desalination relies on the processes of evaporation and condensation through a seawater desalination device

تتم عملية تحلية مياه البحر لمواجهة نقص الموارد من المياه العذبة الصالحة للشرب أو الري، وخاصة في المناطق النائية. ويعتمد مبدأ التحلية على عمليات التبخر والتكثيف من خلال جهاز تحلية مياه البحر.



Lesson one

1. Write the scientific term

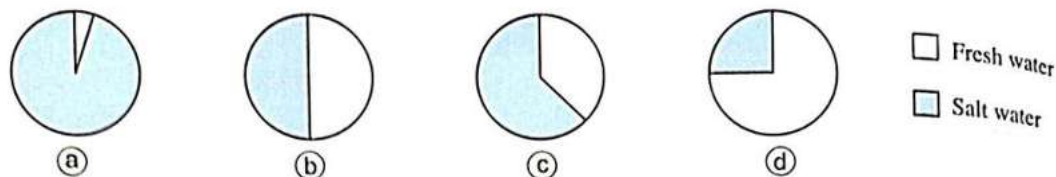
- (1) The transformation of water from the liquid state to the gaseous state when heat is gained. (.....)
- (2) The transformation of water from the gaseous state to the liquid state when heat is lost. (.....)
- (3) The transformation of water from the solid state to the liquid state when heat is gained. (.....)
- (4) The transformation of water from the liquid state to the solid state when heat is lost. (.....)
- (5) A natural process that involves the movement of water between the atmosphere and the Earth in a closed, multi-path cycle. (.....)
- (6) The process of water loss from plants in the form of water vapor. (.....)
- (7) The process of falling of cloud water to the Earth's surface in the form of rain, snow, or hail due to the force of gravity. (.....)
- (8) The process of the flow of rainwater on the Earth's surface, and from there to the rivers, seas, and lakes due to the force of gravity. (.....)
- (9) The process of removing dissolved salts from seawater. (.....)

2- Choose the correct answer from the given answers:

(1) The percentage of water on the Earth's surface is about

- a) 3% b) 71% c) 70% d) 29%

(2) Which of the following shapes expresses the amount of freshwater compared to the amount of water on the surface of the Earth?

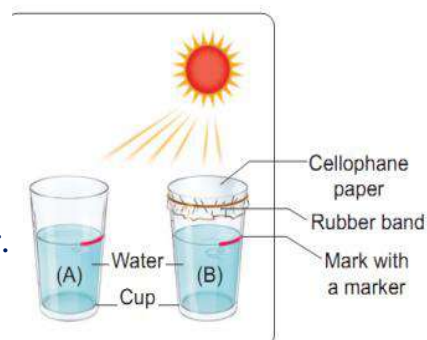


(3) What is the process that leads to the disappearance of a water puddle on the surface of a house?

- (a) Condensation (b) Precipitation (c) Evaporation (d) Weathering

(4) From the experiment shown in the figure opposite, what happens after 6 hours from the beginning of the experiment?

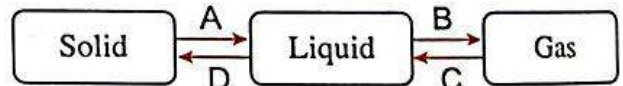
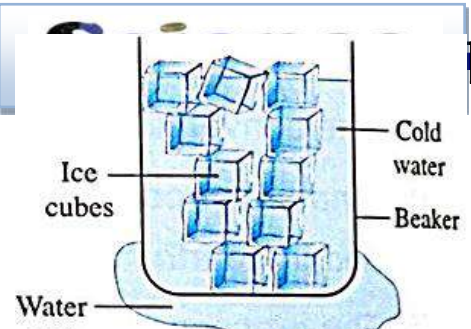
- (a) The amount of water in the beaker (B) decreases.
 (b) The amount of water in the beaker (A) does not change.
 (c) The volume of water in the two beakers (B) and (A) changes.
 (d) The cellophane prevents the condensation of water vapor.



(5) The opposite figure shows the formation of a puddle of water around a cup containing cold water and ice cubes.

What is the source of the water forming the puddle?

- (a) Ice cubes.
 (b) Cold water
 (c) Oxygen in the air
 (d) Water vapor in the air
 (6) From the diagram opposite, which of the following is correct?



Choice	(A)	(B)	(C)	(D)
(a)	Freezing	Condensation	Melting	Evaporation
(b)	Evaporation	Freezing	Condensation	Melting
(c)	Melting	Evaporation	Condensation	Freezing
(d)	Condensation	Melting	Evaporation	Freezing

(7) What is the step that plants perform in the water cycle?

- (a) Condensation (b) Evaporation (c) Precipitation (d) Transpiration

(8) The process that directly precedes condensation in the water cycle in nature is:

- (a) Surface runoff (b) Evaporation (c) Infiltration (d) Precipitation

(9) All of the following are factors that contribute to the movement of water during the water cycle, except for:

- (a) Gravity (b) Clouds (c) Wind (d) Sun

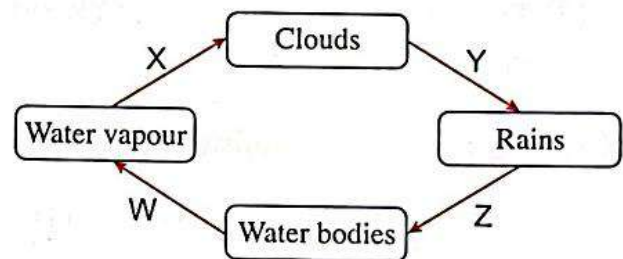
(10) In which of the following paths during the water cycle in nature is water present in the liquid state?

- (a) Precipitation and transpiration (b) Infiltration and surface runoff
 (c) Clouds and hail (d) Frost and transpiration

(11) From the opposite water cycle:

1. Which of the following expresses the processes (W) and (X)?

- (a) (W): Evaporation; (X): heat gain.
 (b) (W): Condensation; (X): heat lose
 (c) (W): Condensation; (X): heat gain.
 (d) (W): Evaporation; (X): heat lose.



2. Changes in the physical states of water occur during these processes:

- (a) (X) and (Y) only (b) (W) and (Z) only
 (c) (X) and (Z) only (d) (W), (X), and (Y) only

(12) All the following are processes that occur during the water cycle in nature, except for:

- (a) Weathering (b) Transpiration (c) Precipitation (d) Infiltration



3-Choose from column (B) what matches column (A), and rewrite the complete statements:

(A)	(B)
(1) <u>Condensation</u>	(1) Transformation of water from the gaseous state to the liquid state.
(2) <u>Evaporation</u>	(2) Transformation of water from the liquid state to the gaseous state.
(3) <u>Precipitation</u>	(3) The flow of water above the surface of the earth.
(4) <u>Surface Runoff</u>	(4) The flow of water through the layers of the soil.
(5) <u>Infiltration</u>	(5) Falling of rain on the surface of the Earth.

4) Complete the following sentences with what is appropriate:

- (1) Water is used in drinking..... and beside, it plays a vital role in regulating of earth planet
- (2) Water exists in winds and in the state and exists in clouds in the Andstates
- (3) Water vapor condenses and turns into water droplets when itthermal energy, while ice melts and turns to liquid water when itthermal energy.
- (4) During the process of the transformation of matter, two processes occur: and at a certain temperature.
- (5) sources of water vapor in nature are and
- (6) When small accumulate during thunderstormsprecipitate.
- (7) Part of the rainwater infiltrates into the cracks of the earth's crust due toand stored as
- (8) The two main factors that preserve the continuaty of the water cycle in nature are and
- (9) The process of is done to face the shortage of fresh water in remote areas.

(5) Complete the following diagram:



(6) Correct the following underlined words:

- (1) The terrestrial part is about 3% of the Earth's surface structure.
- (2) Water vapor turns into liquid water during the melting process.
- (3) The melting process of is the reverse of the process of condensation.
- (4) Clouds are formed from the freezing of water vapor in the air.
- (5) the gravity is the cause of the movement of water from the Earth to the air.
- (6) The idea of desalination of water depends on the processes of boiling and condensation.

(7) Mark a (✓) in front of the correct statement or a (x) in front of the incorrect statement, with the correction:

- (1) Water represents about 71% of the human body. ()
- (2) Liquid water turns into ice during the process of condensation. ()
- (3) The rate of evaporation in tropical areas is faster than in polar regions. ()
- (4) The ice in the polar regions melts when it gains heat and turns into water. ()
- (5) Water evaporates from bodies of water due to the energy derived from the heat of the sun. ()
- (6) Water is transferred from the oceans to the air through the process of evaporation. ()
- (7) When the temperature of the clouds is lower than the freezing temperature, snow falls instead of rain. ()
- (8) Rainwater flows on the surface of the earth, and from there to the water bodies, due to the effect of gravity. ()
- (9) Water forms a comprehensive ecosystem in which different pathways interact in a cyclical way. ()

8-Give reasons for the following:

- (1) The importance of water is great for all living organisms on the surface of the Earth.
.....
- (2) Conserving the consumption of fresh water is essential.
.....
- (3) Boiling point is a characteristic feature of pure materials.
.....
- (4) Water droplets form on the outer surface of a cup of water containing ice cubes.
.....
- (5) The sun and gravity together maintain the continuity of the water cycle in nature.
.....
- (6) Desalination of water is carried out in some remote regions.
.....

9-What is meant by each of the following?

- (1) Evaporation. (2) Condensation. (3) Water cycle. (4) Transpiration.
- (5) Precipitation. (6) Surface runoff. (7) Desalination of sea water.

10-State the importance or use of each of the following:

- (1) Water. (2) Heat of the sun in the water cycle.
- (3) Wind in the water cycle. (4) The force of gravity in the water cycle.
- (5) Desalination of seawater.



Lesson (2) Rocks

Rocks

Solid bodies are composed of one or more minerals.

Location

Rocks are found on the Earth's surface, beneath it, or at the bottom of oceans.

Classification of Rocks -Rocks are classified according to their mode of formation into:

1. Sedimentary Rocks
2. Metamorphic Rocks
3. Igneous Rocks

تصنيف الصخور - تصنف الصخور حسب طريقة تكوينها إلى:
1. الصخور الرسوبية 2. الصخور المتحولة 3. الصخور النارية

The Role of Earth Processes in Rock Formation

First	Second	Third
Weathering	Erosion	Melting and Crystallization

First: Weathering

Weathering: The process of breaking down and fracturing rocks, which may take millions of years.

Types of Weathering: 1-Mechanical Weathering 2-Chemical Weathering

1-Mechanical Weathering:

When a glass bottle filled to its brim with water is placed in a refrigerator, it will break due to the increase in the volume of water when it freezes

Mechanical Weathering : is the process of breaking and fragmenting the rocks without any change in their chemical structure.

التجوية الميكانيكية هي عملية كسر وتفتيت الصخور دون أي تغيير في تركيبها الكيميائية.

Activity: 1-Fill a thin-walled plastic container with water up to its edge, then close it tightly.

2- Place the container in the refrigerator for several hours.

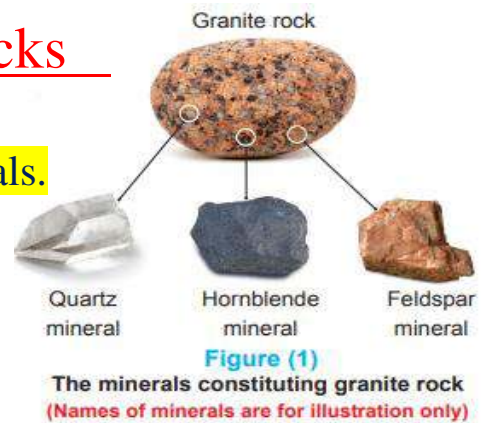
What happens to the volume of the water when it freezes?

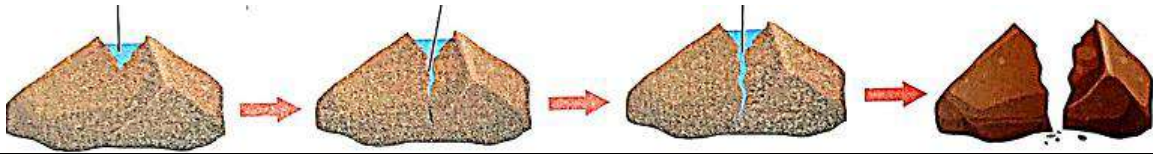
The freezing of water in rock crevices (cracks) is one of the causes of mechanical weathering, which leads to their breakage

Causes of Mechanical Weathering

1-Freezing of water in the cracks (crevices) of rocks

Water seeps and collects within the <u>fine cracks</u> of the rocks	Water freezes when the temperature drops and then <u>its volume increases</u> causing the cracks of the rocks to widen	The <u>ice melts</u> , and <u>water fills</u> the newly formed cracks	The cycle of melting and freezing continues until the rocks are broken
---	--	---	--



2-Water flowMechanical weathering of rocks
by water flow3-Wind blowingMechanical weathering of rocks by wind
blowing, as seen in the rock located in the
White Desert National ParkGrowth of plant roots within the
rock cracksMechanical weathering of
rocks by plant roots

Thermal expansion and contraction of the minerals that make up the rocks, are a result of **the difference in temperature between day and night**, are illustrated in Figures (6) : (8).

2- Chemical Weathering

Chemical weathering is the process of breaking down and fragmenting rocks with a change in their chemical structure

Activity Concept of chemical weathering

Steps

- 1-Put a piece of limestone on a glass plate
- 2-Add drops of an acid to a piece of limestone
- 3-Bring a lit matchstick close to the formed bubbles of gas

Observation

The rock gets corroded and bubbles of gas evolve
The matchstick goes out

Conclusion

A chemical change occurs in calcium carbonate substance which makes up the limestone when acid is added to it, leading to the corrosion of the limestone, this is known as chemical weathering.

It is clear from the previous that:

Chemical substances such as **acids and mineral materials** found in groundwater, as well as the acid rains **cause chemical weathering of rocks**.

The hot springs of **Yellowstone National Park in the United States** (Figure 11) are a good example of **chemical weathering caused by mineral-rich hot water**.

Spherical weathering (Figure 12) is one form of **chemical weathering** (Figure 13)

The hot springs of Yellowstone National Park in the United States represent a good example of chemical weathering.



Due to the effect of mineral-rich hot water which causes the breaking down and fragmentation of the rocks and .changes their chemical composition

تمثل الينابيع الساخنة في منتزه يلوستون الوطني في الولايات المتحدة مثلاً جيداً للتجوية الكيميائية. بسبب تأثير المياه الساخنة الغنية بالمعادن والتي تسبب تفتيت الصخور وتغير تركيبها الكيميائي.



Yellowstone National Park

Spherical weathering

One of the forms of chemical weathering in which rocks continuously turns into spherical form due to the process of continuous erosion

التجوية الكروية

أحد أشكال التجوية الكيميائية التي تتحول فيها الصخور باستمرار إلى شكل كروي بسبب عملية التآكل المستمر

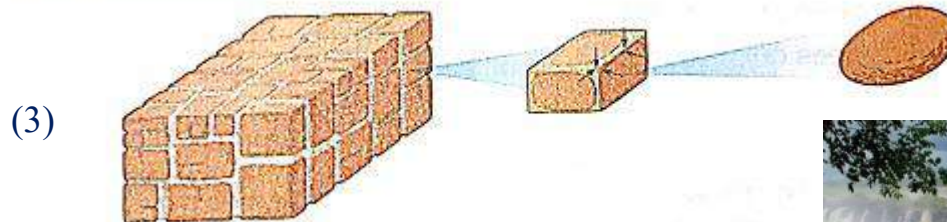


Mechanism of spherical weathering

Rock blocks (such as granite) are subjected to chemical weathering

The comers weather more quickly

The rock turns into spherical form as the erosion continues



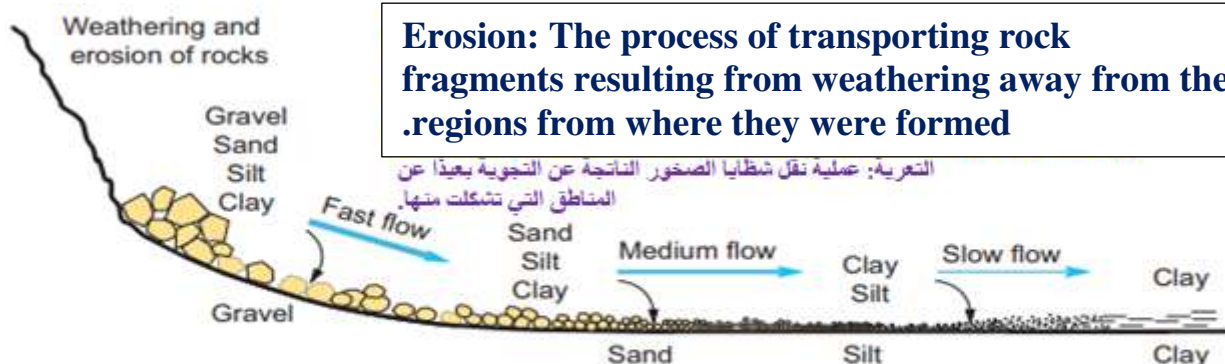
Second Erosion:

Why does the water coming from the Ethiopian Plateau appear brown?

How was the agricultural soil in Egypt formed over millions of years?

When rainfall occurs on the Ethiopian Plateau, a weathering process of the rocks takes place,

Followed by an erosion process, during which the rock fragments resulting from the weathering are transported away from the areas where they were originally found



Sediments. The fine fragments of rocks that are transported away from the area of weathering.

الرواسب: شظايا الصخور الدقيقة التي يتم نقلها بعيداً عن منطقة التجوية.

GR: Erosion is a double-edged sword.

As it has beneficial and harmful effects at the same time.

Beneficial effects: The formation of agricultural soil over millions of years in Egypt and the formation of river deltas.

Harmful effects: Erosion of beaches by sea waves.

G.R. ج: التعرية سلاح ذو حدين. فإن لها أثراً مفيداً وضاراً في نفس الوقت. الآثار المفيدة: تكوين التربة الزراعية على مدى ملايين السنين في مصر وتكوين دلتا الأنهار. الآثار الضارة: تآكل الشواطئ بفعل أمواج البحر.

The role of pressure in the lithification (compaction and cementation) of sedimentary rocks

دور الضغط في عملية التكتل (الضغط والتصلب) للصخور الرسوبية

After the processes of transportation and sedimentation, sediments are compacted over the years into layers, that undergo lithification process that transforms them into cohesive (cemented) rocks known as sedimentary rocks.

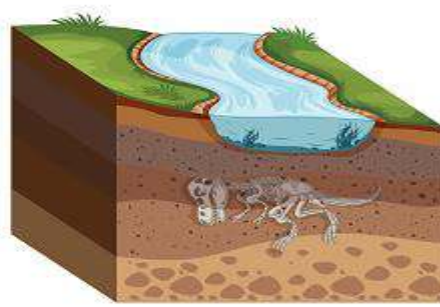
بعد عمليات النقل والترسيب، يتم ضغط الرواسب على مر السنين إلى طبقات، تخضع لعملية التكتل التي تحولها إلى صخور متماسكة (متماسكة) تعرف بالصخور الرسوبية.

Lithification The compaction of sediments over the years into layers forming sedimentary rocks

التكتل ضغط الرواسب على مر السنين إلى طبقات تشكل الصخور الرسوبية

Sedimentary rocks Cohesive rocks formed from the lithification of sediments

الصخور الرسوبية الصخور المتماسكة التي تشكلت من تكتل الرواسب



What is the relation between the volume of the transported sediments and the speed of water flow during the erosion process

Answer The fast flow of water transports large-sized sediments, and as the speed of water flow decreases, the size of the transported sediments decreases

ما هي العلاقة بين حجم الرواسب المنقولة وسرعة جريان الماء أثناء عملية التعرية الإجابة: ينقل التدفق السريع للمياه الرواسب كبيرة الحجم، ومع انخفاض سرعة تدفق المياه، يقل حجم الرواسب المنقولة.

Evaluate Your Understanding:

Which of Figures (1), (2) represents an erosion process? Explain.

Figure (1)/

Explain Due to the occurrence of chemical weathering of rocks by the action of rainfall then followed by the process of transporting rock fragments away from the areas where they were originally found, and their deposition in sedimentation areas.

(أي من الشكلين (1)، (2) يمثل عملية تآكل؟ وضح. الشكل (1)/

التوضيح نتيجة لحدوث التجوية الكيميائية للصخور بفعل هطول الأمطار ثم يلي ذلك عملية نقل شظايا الصخور بعيداً عن المناطق التي وجدت فيها أصلاً، وترسيبها في مناطق الترسيب.

What are the results of

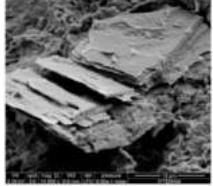
The Increase in the pressure applied on the rock fragments (sediments)

Becomes more cohesive resulting over the years In the formation of solid layers on top of each other, forming sedimentary rocks

زيادة الضغط المطبق على شظايا الصخور (الرواسب)

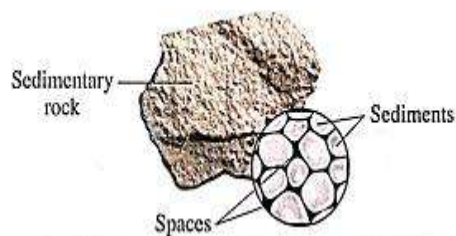
تصبح أكثر تماسكاً مما يؤدي مع مرور السنين إلى تكوين طبقات مترابطة فوق بعضها البعض مكونة الصخور الرسوبية.

Examples of sedimentary rocks

Limestone	Sandstone	Claystone
		

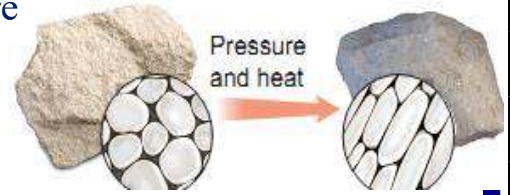
Characteristics of sedimentary rocks

1-They are porous rocks	1-They are contains fossils
Due to the presence of spaces between the particles of the sediments which compose them	



Third Melting and crystallization:

When the rocks located beneath the Earth's surface are subjected to pressure and heat without reaching the melting point, the particles of the rocks come closer together, reducing the spaces present between these particles, which leads to an increase in their hardness forming new rocks known as **metamorphic rocks**



Metamorphic rocks -Rocks formed through the exposure of rocks located beneath the Earth's surface to pressure and heat without reaching their melting point

الصخور المتحولة الصخور التي تشكلت نتيجة تعرض الصخور الموجودة تحت سطح الأرض للضغط والحرارة دون أن تصل إلى نقطة انصهارها

<u>Marble</u>	<u>Quartzite</u>
Way of formation	
the transformation (metamorphism) of <u>limestone</u> rock	the transformation (metamorphism) of <u>sandstone</u> rock



Limestone



Marble



Sandstone



Quartzite

The role of melting and crystallization in the formation of igneous rocks

When temperature and pressure increase by moving from the Earth's crust towards its interior, the minerals that compose certain rocks melt, leading to the formation of magma.

دور الذوبان والتبلور في تكوين الصخور النارية
عندما ترتفع درجة الحرارة والضغط بالانتقال من قشرة الأرض إلى داخلها، تذوب المعادن التي تتكون منها بعض الصخور، مما يؤدي إلى تكوين الصهارة. الحمم البركانية

Magma An extremely hot molten material formed through the melting of minerals which compose certain rocks within the Earth's interior

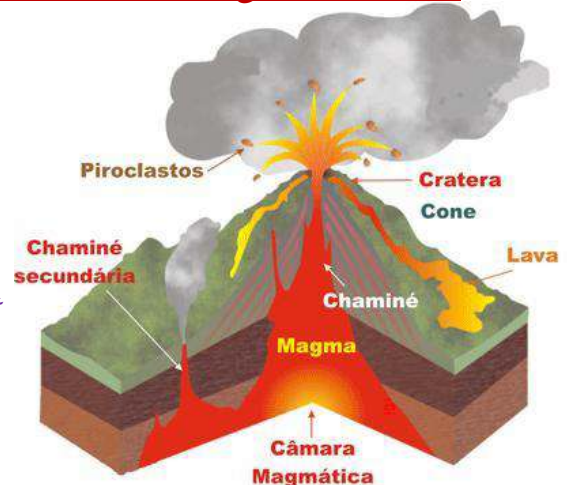
الصهارة مادة منصهرة شديدة السخونة تتكون من ذوبان المعادن التي تتكون منها بعض الصخور داخل باطن الأرض.

When a volcano erupts Some of magma emerges with the remaining volcanic products to the Earth's surface, and loses a huge amount of the gases which were mixed with it, forming what is known as lava

عندما يثور البركان: تخرج بعض الصهارة مع المنتجات البركانية المتبقية إلى سطح الأرض، وتنفد كمية هائلة من الغازات التي اختلطت بها، مكونة ما يعرف بالحمم البركانية

Lava Magma when it reaches the Earth's surface

اللافا الماجما عندما تصل إلى سطح الأرض



The rest of magma overlaps between the cracks and the layers of the Earth's crust. when these molten materials cool, they form a third type of rock known as Igneous rock

تتراكم بقية الصخور النارية بين الشقوق وطبقات قشرة الأرض، وعندما تبرد هذه المواد المنصهرة فإنها تشكل نوع ثالث من الصخور يعرف بالصخور النارية

Igneous rock الصخور النارية

Rocks formed by the solidification of lava on the Earth's surface or from the solidification of magma between the cracks and the layers of the Earth's crust

الصخور التي تشكلت نتيجة تصلب الحمم البركانية على سطح الأرض أو نتيجة تصلب الصخور النارية بين الشقوق وطبقات قشرة الأرض

Types of igneous rocks

<u>Plutonic Igneous rocks</u> الصخور النارية البلوتونية (الجوفية)		<u>Surface igneous rocks</u> الصخور النارية السطحية	
Plutonic rock (Gabbro) Magma chamber Lava Magma chamber Volcanic rock (Pumice)			
طريقة التكون Way of formation			
Magma cools very <u>slowly</u> in the cracks and the layers of the Earth's crust تبرد الصهارة ببطء شديد في الشقوق وطبقات قشرة الأرض		Lava cools <u>quickly</u> on the surface of the Earth's crust تبرد الحمم البركانية بسرعة على سطح قشرة الأرض	
<u>What is the result of this</u> The formation of rocks with <u>large crystals</u> , known as <u>plutonic igneous rocks</u> ما هي نتيجة ذلك تكوين الصخور ذات البلورات الكبيرة، والمعروفة بالصخور النارية البلوتونية		<u>What is the result of this</u> The formation of rocks with <u>small crystals</u> , known as <u>surface igneous rocks</u> ما هي نتيجة ذلك تكوين الصخور ذات البلورات الصغيرة، والمعروفة بالصخور النارية السطحية	
<u>Examples Plutonic igneous rocks</u>		<u>Examples Surface igneous rocks</u>	
Granite	Gabbro	Basalt	Pumice

G.R It is possible to distinguish the crystals of granite by the naked eye, while that of basalt cannot be distinguished by the naked eye

Because the crystals of granite are large due to the slow cooling of magma, while the crystal of basalt are small due to the rapid cooling of lava

ج.ر. من الممكن التمييز بين بلورات الجرانيت بالعين المجردة، بينما لا يمكن التمييز بين بلورات البازلت بالعين المجردة

لأن بلورات الجرانيت كبيرة بسبب التبريد البطيء للمagma، بينما بلورات البازلت صغيرة بسبب التبريد السريع للحم البركانية.

Integration with the Science of Construction

Rocks of all types are used in construction, as exemplified by

the use of limestone in the construction of the Pyramids of Giza in Egypt

the use of marble in the construction of the Taj Mahal in India

Cross-Cutting Concepts : Cause and Effect

Rocks transform from one type to another through several processes, such as: **weathering and erosion**, **extreme pressure and heat**, **melting and cooling**, forming what is known as **the rock cycle** (Figure 30).

The rock cycle

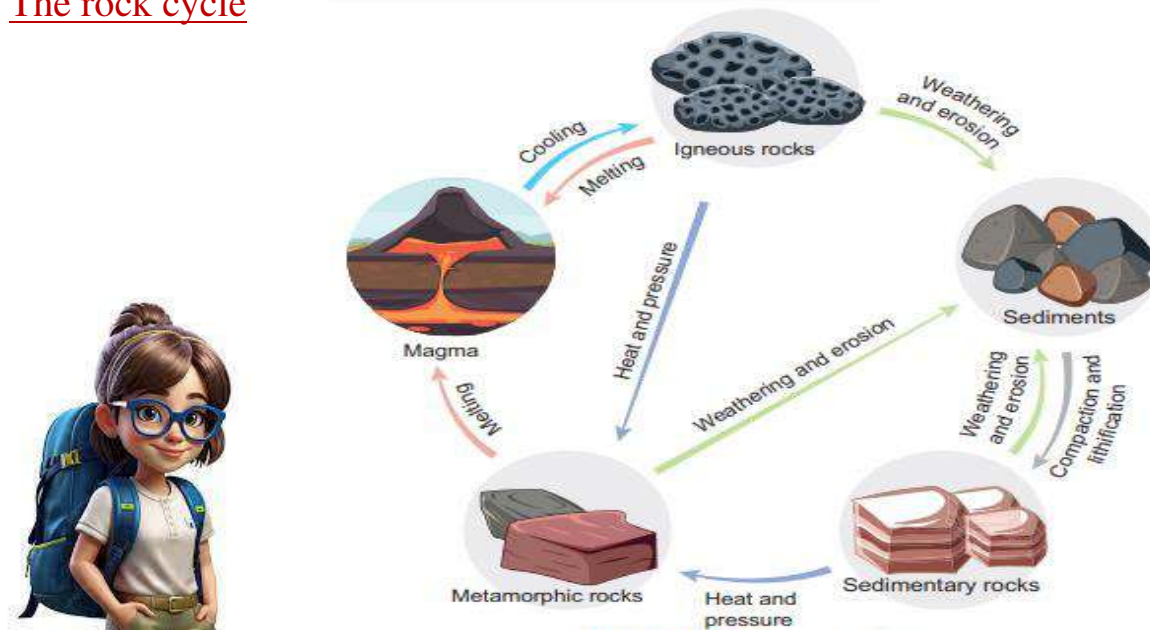


Figure (30) The rock cycle

The Role of the geological (Earth's) Processes in the Formation of Fossil Fuels:

The light energy of the sun is converted into chemical energy stored in plants through the process of photosynthesis, and a part of this energy is transferred to living organisms that feed on plants. Fossil fuels (Figure 31) were formed millions of years ago as a result of a series of physical and chemical changes of organic substance in the Earth's interior.

Plants-especially large ones-represent the organic origin of coal, while marine microorganisms represent the organic origin of petroleum oil, and natural gas whose major component is methane gas (forms more than 90% of it). Upon the combustion of fossil fuel, the energy stored within it, which is primarily derived from the sun, is released.

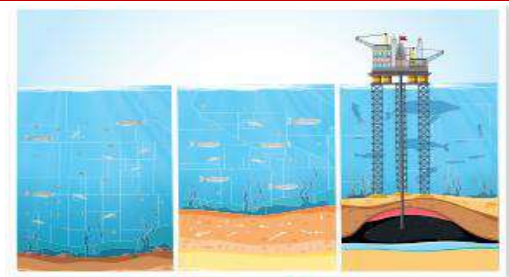


Figure (31)
Formation of petroleum and natural gas



Lesson two1. Write the scientific term

- 1-Solid materials composed of one or more minerals. (.....)
- 2-The process of fracturing and breaking down rocks that takes millions of years.
- 3-The process of fracturing and breaking down rocks without changes in their chemical composition. (.....)
- 4-The process of fracturing and breaking down rocks with changes in their chemical composition. (.....)
- 5-Chemical weathering that causes the formation of spherical rocks(.....)
- 6-The process of transporting rock fragments resulting from weathering away from the locations from which they were formed. (.....)
- 7-The transported rock fragments away from the area where weathering took place. (.....)
- 8-Cohesive rocks formed by the lithification of sediments. (.....)
- 9-The compression of sediments in layers over the years, resulting in the formation of sedimentary rocks. (.....)
- 10- Rocks formed when rocks located beneath the Earth's surface are subjected to pressure and heat, but without reaching their melting point. (.....)
- 11-Molten rock in the Earth interior. (.....)
- 12-Magma when it reaches the surface of the Earth. (.....)
- 13-Rocks formed by the solidification of lava or magma. (.....)
- 14-Rocks that form from a slow decrease in the temperature of magma inside the Earth's crust. (.....)
- 15-Rocks that form from a fast decrease in the temperature of lava on the Earth's surface. (.....)
- 16-The transformation of rocks from one type to another. (.....)
- 17-Fuel formed in the Earth interior

2-Choose the correct answer from the options given:

1-All of the following are causes of mechanical weathering, EXCEPT:

- | | |
|--------------------------------------|---------------------------------------|
| a) Running water | b) Freezing of water in rock fissures |
| c) Thermal expansion and contraction | d) Acid rain |

2-The figure opposite:

Represents the process (X) of one rock by the effect of (Y)

Which of the following describes (X) and (Y)?

- a) (X) : Erosion, (Y) : Thermal expansion and contraction
- b) (X) : Chemical Weathering , (Y) : Running water
- c) (X) : Mechanical Weathering, (Y) : Wind Erosion



d) (X) : Erosion, (Y) : Acid Rain

3-Limestone rock is composed of:

- a) Sodium Carbonate b) Calcium Carbonate
c) Ammonium Carbonate d) Calcium Sulfate

4-Examples of chemical weathering:

- a) Mechanical weathering b) Weathering by plant roots
c) Spheroidal Weathering d) Weathering by wind erosion

5-Which of the following rocks is used, after being crushed, in making casts?

- a) Gabbro b) Limestone c) Sandstone d) Pumice

6-The opposite figure: Represents clay deposits that are the direct result of processes of:

- a) Cooling and Crystallization b) Weathering and Erosion
c) Melting and Solidification d) Transformation and Cohesion

7-Which of the following rocks are formed as a result of lithification of sediments?

- a) Quartzite b) Pumice c) Sandstone d) Marble

8-The formation of river deltas is a result of:

- a) Crystallization b) Chemical weathering c) Melting d) Erosion

9-Which of the following pairs correctly identifies a sedimentary rock and the resulting metamorphic rock?

- a) Sandstone – Limestone b) Limestone – Marble
c) Quartzite – Sandstone d) Limestone – Quartzite

10-Rocks that are formed as a result of high pressure and heat are:

- a) Quartzite. b) Shale. c) Pumice. d) Gabbro.

11-When lava cools, the rock formed is :

- a) Gabbro b) Pumice. c) Granite. d) Sandstone.

12-Which of the following is an intrusive igneous rock?

- a) Granite b) Marble c) Basalt d) Quartzite.

13-Metamorphic rocks turn into igneous rocks through:

- a) Erosion and weathering b) Weathering and transportation
c) Melting and Crystallization d) Deposition and lithification

14-The rock that is used to build the Taj Mahal in India is:

- a) Limestone b) Marble c) Pumice d) Granite

15-Remains of microscopic marine animals transform into, after millions of years in the Earth's interior:

- a) Granite b) Limestone c) Oil d) Coal

16-Which gas constitutes more than 90% of natural gas?

- a) Carbon dioxide b) Chlorine c) Nitrogen d) Methane



3. Choose the correct matching term from column (B) that fits with the item in column (A), and write the completed sentences:

(1)

(A) Rocks	(B) Result of
1) <u>Plutonic Igneous Rocks</u>	1) The exposure of the rocks beneath the Earth's surface to extreme pressure and heat
2) <u>Sedimentary Rocks</u>	2) Cooling of lava quickly on the Earth's crust surface
3) <u>Metamorphic rocks</u>	3) Accumulation of layers of sediments
	4) Magma Solidifies slowly in Earth's crust

(2)

(A)	(B)
1) <u>Claystone</u>	1) Resulting from the transformation of limestone
2) <u>Gabbro</u>	2) Surface igneous rock
3) <u>Quartzite</u>	3) Plutonic igneous rock
3) <u>Pumice</u>	4) Resulting from compaction and lithification
	5) Resulting from the transformation of sandstone

4-Complete the following sentences with appropriate terms:

- 1-Rocks are classified based on their mode of formation into , and metamorphic rocks.
- 2-The types of weathering include: mechanical weathering and
- 3-One of the causes of weathering is the freezing of water and growth of in rock fissures
- 4-The hot springs in Yellowstone National Park are examples of weathering.
- 5-..... and present in groundwater causes the chemical weathering of rocks.
- 6-The powder from crushing rock is used to make casts.
- 7-..... rocks originate from the fracturing of old rocks while..... rocks form from the exposure of old rocks to high pressure and heat
- 8-Shale is a rock, while marble is a rock.
- 9-..... rock is formed from transformed sandstone and rock is formed from the transformation of limestone.
- 10-Based on their formation locations, igneous rocks are classified into and
- 11-Granite rock is composed of large crystals, while basalt is composed of crystals.
- 12-Gabbro is one type of rocks, while pumice is one type of rocks.

13-The organic origin of coal is, while that of natural gas is

14-..... rocks are used in building the Giza Pyramids.

5-Mark (✓) if the statement is correct or (X) if it is incorrect with the correction:

1. The expansion of water when it freezes in rock fissures causes chemical weathering
2. Minerals expand during night due to a decrease in temperature
3. Limestone, a sedimentary rock, corrodes by acid rain
4. Metamorphic rocks are porous because of the gaps between the particles of rocks
5. Quartzite is more solid than sandstone.
6. Intrusive igneous rocks form due to heat and pressure.
7. The magma takes a longer time to cool leading to large crystals.
8. Pumice is a shallow intrusive igneous rock with small crystals.
9. Photosynthetic energy is stored as chemical energy in plants.
- 10-Plants are the organic origin of natural gas.



6-Give one example of:

- 1-A type of chemical weathering
- 2.A reserve that exhibits chemical weathering
3. Sedimentary Rock
- 4.Metamorphic Rock
- 5.Intrusive Igneous Rock
6. Extrusive Igneous Rock
7. Sedimentary rock that was used in the past in construction.
8. A metamorphic rock that is used in construction.
- 9.A fossil fuel from microscopic marine animals 10-A fossil fuel from plants



7-Give the Reason For the Following:

- 1-A closed, full water bottle will break when placed inside a freezer.
.....
- 2-The freezing of water in rock fissures will lead to the fracturing of rocks.
.....
- 3-Expansion and contraction of minerals occurs in rocks
.....
- 4-Acids and other minerals are one of the causes of chemical weathering
.....
- 5-Yellowstone National Park is considered a good example of chemical weathering
.....

6-Limestone rock is used to treat bone fractures

7-Erosion is a double edged sword

8-Crystals of extrusive igneous rocks are small

9-Gabbro is considered an intrusive igneous rock and Quartzite is a metamorphic rock

10-Minerals of Granite rocks are visible to the naked eye and the Minerals of Basalt are not visible to the naked eye.

11-The importance of marble in ancient architecture

12-Solar energy is the basis for fossil fuels.

8-Define each of the following

Rocks- Weathering -Mechanical Weathering-Chemical Weathering
 -Spheroidal Weathering -Erosion -Sediments -Lithification -Metamorphic Rocks
 -Igneous Rocks -Magma -Lava -Fossil fuels -The rock cycle

9-State one difference between each of the following:

1. Weathering and Erosion
2. Sandstone and Quartzite
3. Gabbro and Pumice
4. Coal and Petroleum



10-Compare between the following:

- 1-Mechanical Weathering and Chemical Weathering (in terms of: definition - causes).
- 2-Magma and Lava (in terms of: definition - rocks that are formed by solidification).
- 3-Intrusive and Extrusive Igneous rocks (in terms of: mode of formation - crystal size - and one example of each)
- 4-Granite and Basalt (in terms of: type - crystal size - mode of formation)
- 5-Igneous and Sedimentary rocks (in terms of: mode of formation - example)
- 6-Marble and Limestone (in terms of: rock type - mode of formation - use)

11-What would be the results of the following:

1. Physical and chemical changes in Earth materials over many years
2. Water freezing in rock fissures
3. Wind erosion of rocks in the White Desert Nature Reserve.
4. The expansion and contraction of minerals in rocks.



5. Addition of drops of acid to a piece of limestone
6. Bringing a burning match close to the gases that result from chemical weathering of limestone
7. Masses of granite rocks being exposed to chemical weathering
8. Increased pressure on sediments
9. Rocks located beneath the surface of the Earth being exposed to heat and pressure, but not to their melting point.
10. Limestone melting due to high heat and then recooling
11. Sandstone being exposed to heat and pressure
12. The slow decrease of the temperature of magma inside the Earth's crust
13. The fast decrease of temperature of lava on the surface of the Earth.
14. The burning of fossil fuels

12-Chose the odd word or phrase, then write the relationship between the other words or phrases:

- 1-Weathering / Climate / Erosion / Melting and Crystallization.
- 2-Freezing of water in rock fissures / Acidic rain / Expansion of minerals in rocks during the day / Wind erosion
- 3-Lithification/ Disintegration / Deposition / Crystallization
- 4-Limestone / Marble / Sandstone / Shale
- 5-Used in building the Giza pyramids / Sedimentary rock / Metamorphic rock / used in the making of casts
- 6-Gabbro / Pumice / Granite / Quartzite
- 7-Natural gas / Coal / Petroleum / Basalt



Guide answer

For

Science

Second term

1st prep

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Lesson one1 Write the scientific term1- Metals2- Nonmetals3- Carbon (graphite)4- Metallic bond5- Alloy6- Recycling2. Choose the correct answer:(1) c. Bad electricity conductor (2) b. $Al > Mg > Na$ (3) c. Ductile(4) d. Is it brittle(5) D. Physical(6) a. 1:3 electrons(7) c. Conducts heat, has a metallic luster(8) a. A.(9) a. bromine(10) c. Graphite and aluminum(11) b. Atoms of the same metal(12) B) valence electrons(13) a. ${}_{13}Al$ (14) d. 95%

<u>(15)</u>	<u>a</u>	<u>High</u>	<u>Easy</u>	<u>Medium</u>
-------------	----------	-------------	-------------	---------------

3- Choose from column (B) what matches column (A). (12) B)(1/4), (2/5), (3/1), (4/3).4-Complete the following sentences with the appropriate word(1) 4/8(2) Nonmetallic/Carbon (graphite).(3) Metals/Nonmetals. (4) Increases/Increases. (5) Tin / Copper.5-Put (✓) and (X)(2) (✓) (2). (X) higher than... (3) (X) Graphite....(4) (X) Mercury (5) (X) greater than that in sodium.(6) (X) by metallic bonds. (7) (X) is less harder than6-Give reasons for the following:(1) Because the outermost energy level of magnesium atom contains 2 electrons, while the outermost energy level of sulphur atom contains 6 electrons.(2) Because Graphite is the only good electrical conductor nonmetal.(3) Because sulphur is a brittle nonmetal (not malleable).(4) Due to The more valence electrons there are in an atom (3 electrons)(5) (6) Because alloys (Bronze) are harder than pure metals, that are soft and almost unfit for the industrial uses.(7) 1-Their percentage in the earth's crust decreases and It is difficult to extract them from their ores7-What happens when:(1) A piece of sulphur crumbles easily.(2) The melting points of metals are high.(3) The alloys formed and become harder than pure metals,8-cross out the odd word. what connects the rest of the words

	<u>The odd word</u>	<u>The relation between the rest</u>
<u>1</u>	<u>Mercury</u>	<u>Solid metals</u>
<u>2</u>	<u>Carbon</u>	<u>Metals</u>
<u>3</u>	<u>Aluminum</u>	<u>Nonmetals</u>
<u>4</u>	<u>Graphite</u>	<u>Bad electrical conductors non metals</u>

Lesson two1-Write the scientific term (or name)

- 1-Atomic Group 2-The Scientist Arrhenius 3- Oxyacids
 4-Hydrochloric Acid 5- Lactic Acid 6-Acid
 7-Alkali 8-Strong Acids 9-Basic Oxides
 10-Acidic Oxides 11- Acid Rains

2.Choose the correct answer:

- (1) c. Hydride OH^- (H^-) (2) c. SO_3^{2-} , NO_3^- (3) b. Oxygen element
 (4) a. Charge and number of elements only. (5) a. HCl
 (6) c. Sulforous acid (7) c. H_2SO_3 (8) d. Hydroxide group
 (9) c. The cation in it carries two positive charges (10) b. Ketchup and grapes
 (11) c. H^+ (12) c. it reacts with HCl acid (13) d. cations H^+ and SO_4^{2-} anions
 (14) d. NaOH (15) b. Acetic acid (16) c. Sodium hydroxide
 (17) b. $\text{Mg}(\text{OH})_2$ (18) d. Na_2O
 (19) c. They can react with sodium hydroxide solution. (20) d. NaCl
 (21) c. NO_2 , SO_2 (22) b. Destruction of the human digestive system

3-Write the Names of the following acids and alkalis:

acids and alkalis	The Names
a. H_2CO_3	Carbonic acid
b. HF	Hydrofluoric acid
c. LiOH	Lithium hydroxide
d. $\text{Mg}(\text{OH})_2$	Magnesium hydroxide

4-Write the chemical formula for each of the following..

- (1) Sulfuric acid. H_2SO_4 (2) Sodium hydroxide. NaOH

5-Complete the following sentences

- 1-Ammonium / Phosphate 2-Hydrogen H^+ /Hydroxide OH^-
 3-Sulphurous acid / H_2SO_3 4-Hydrogen iodide / Hydroiodic acid
 5-Hydrogen H^+ / Bromide Br^- 6- Acidic / Alkali
 7- Hydrogen H^+ /Hydroxide OH^- 8-Hydrogen chloride HCl / Hydrogen H^+
 9- Sodium hydroxide NaOH / Sulphurous acid H_2SO_3
 10-Metal (Basic) / Nonmetal (Acidic) 11-Sulphur / Sulphuric acid H_2SO_4
 12-Nonmetal / Metal 13-Acids / Alkalis 14-Salt / Water

6- Mark (✓) or (x) for each statement, with correction:

- (1) (X) with the suffix (- ide) (2) (X) in the charge only (3) (X) is NH_4^+
 4- (X) is chlorous acid 5- (X) Is H_2SO_4
 6- (X) secretes hydrochloric acid 7-(✓) 8-(X) H^+ cations in 9-(✓)
 10- (X) $\text{Mg}(\text{OH})_2$ 11- (X) while MgO
 12- (X) turns blue 13- (X) forming acid rains

7- Give one example for each of the following:

- 1-Hydroxide group OH^- 2- Sulphate group SO_4^{2-}
 3-Nitrate group NO_3^- 4-,5- Sulphuric acid H_2SO_4 - -

6-Nitrous acid HNO_2 7-Sodium hydroxide NaOH 8-Ammonium hydroxide $\text{NH}_4 \text{OH}$ 8- Write the chemical formula for each of the following:(1) HBr 2- HNO_3 3- $\text{H}_2 \text{S}$ 4- H_3CO_3 5- LiOH 6- NaOH 9- Write the name for each of the following acids and alkalis:

.1- Hydro bromic acid 2- Hydrochloric acid 3- Sulphuric acid

4-Hydroiodic acid 5-Magnesium hydroxide 6-Ammonium hydroxide

10-Give reasons for each of the following:

1-Because the number of positive charges = the number of negative charges

2-Because magnesium cation carries two positive charges and the number of hydroxide groups in the molecule equals the magnitude of charge of the cation that composes it

3-Because it participates in food digestion

(4) Because they contain H^+ cations responsible for all acidic properties

5-. Because turns to red in acidic solutions and blue in alkaline solutions..

6-Because hydrochloric acid is a good electrical conductor while acetic acid is a weak electrical conductor

(7) Because Sodium hydroxide good electrical conductivity but ammonium hydroxide bad conductor

(8) Because it contains magnesium hydroxide $\text{Mg}(\text{OH})_2$

(9) Because they produces acidic oxides such as nitrous oxide, - sulfur dioxide

10-Because they dissolve in the atmospheric water vapour forming acid rains that cause health problems in the human respiratory system

Lesson three

1-Write the scientific term or name that

(1) Indicators

(2) .Universal indicator

(3) .The scientist Soren Sorensen

(4) .Potential of hydrogen (pH)

(5)pH meter device

.(6) .Salts.

(7) Salts

2.Choose the correct answer:(1) a. NH_3 (2) c. acidic, H^+ (3) b. The two gases N_2 , CO_2 (4) b. (X) NH_3 , (Y) Cl_2 (5) a. (2), (3) (6) c. Strong acid(7) d. (D) (8) a. (5). (9) b. Banana and tomato (10) d. Grape juice(11) d. Violet (12) d. (1) Yellow, (2) Violet(13) c. Increase the pH value of the soil and treat its acidity . (14) d. potato.(15) b. 6.9:7.1 (16) d. salt (17) d. $\text{Ca}_2(\text{PO}_4)_3$

<u>(18)</u>	b	Ca^{2+}	S^{2-}	Ca_2S_2
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(19) b. Negative sulfate ions with positive ammonium ions.(20) b. Ammonium phosphate (21) d. (1) (3) (4) only(22) d. Its anion is HSO_4^- (23) c. the color (24) d. CuCO_3 (25) c. 726 d. Ammonium chloride (27) b. Na_2CO_3

3-Complete the following sentences with the appropriate word:

- (1)Chlorine Cl_2 /Oxygen O_2 (2)Blue/Red (3) .Red/Blue.
(4) 14/0 (5)Acidic/Neutral (6) .pH meter device/Universal indicator strips.
(7) Cation/Anion (8)Na/ HNO_3 (9) .Cation/Anion (10) .Good/Bad
(11) .) $NiCl_2$ /Green(12) . Copper sulphate / Silver chloride. (13) 10

4-Put (✓) or (X) and correct the wrong :

- 1-(✓) 2-(✓) (3)(X) by using the universal indicator strips.
(4)(X) such as $Ca(OH)_2$ (5)(X) approaches
. (6) ((X) by using pH meter device. (7) (✓)
(8) (X) Melts of solid salts are (9) (X) $NiCl_2$, salt....
(10)(X) does not dissolve.... dissolves in water. (X) (11) ((X) is greater than 7
(12) ((X) increases its density.

5-Give reasons for the following:

- 1- Because some acids are burning and some alkalis are caustic.
(2)Due to the effect of hydrogen cations
3-As the number of H^+ cations equals the number of OH^- anions in the solution (distilled water).
4-Because it gives the same colour with both of them.
5-Because pH meter device determines the pH value of any solution directly and accurately as indicated by the number displayed immediately on its digital screen, while universal indicator strips provide an approximate pH value.
(6) Because the pH value of the oven cleaner is greater than 7, while the pH value of milk is less than 7
7-As pH value of grapes is lower than pH value of tomatoes.
(8)Because the pH value of the laundry bleach is greater than the pH of baking soda.
9-Because the total charge of any salt equals zero, and the phosphate group carries three negative charges, while the nitrate group carries one negative charge.
(10)Because the pH value of ammonium chloride solution is less than 7, while" the pH value of sodium chloride solution equals 7
11-Because the high percentage of the salts in water leads to increasing its density.

6-What are the results of each of the following:

- (1)** 1-The blue litmus strip turns red.
2-The red litmus strip turns blue.
3- The blue litmus strip turns red.
4- The colours of both red and blue litmus strips do not change.
(2) 1- The red litmus strip turns blue.
2- The blue litmus strip turns red.
3- The colours of both red and blue litmus strips disappear.
4- The colours of both red and blue litmus strips do not change.
(3) The red litmus strip turns blue.
(4) Nickel chloride salt dissolves in water, while silver chloride salt does not dissolve in it.

Unit (2)

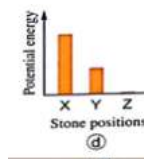
Lesson one

1. Write the scientific term

- (1) Path of movement (2) .Distance (3) .Displacement.
 (4) Speed (5) .Work (6) .Force (7) .Controlling variables.
 (8) Independent variable (9) .Dependent variable.
 (10) Controlled variables (12) .Potential energy.
 (11) Energy (13) . Weight.

2. Choose the correct answer from the given options:

- (1) (C) kg (2) (B) 20 m (3) (D) $v = d/t$ (4) 1-(D) 16 cm 2-(B) 0.5 cm/s
(5) (B) 3 min (6) (A) Joule (7) (A) zero (8) (D) 650 J (9) (B) increases to double
(10) (A) Changes with changes in the independent variable
(11) (C) Height of the ball (12) (D) Weight (13) (B) its weight increases
(14) B at the ground level (15) (A) $PE(1) > PE(2)$
(16) (B) 300 m (17) (C) increase to Doubles
(18) (B) Increases, does not change (19) d
(20) (A) (1), because the work done on it is greater



3. Choose from column (B) what matches column (A)

- 1- (1/3), (2/5), (3/1), (4/2),
2- (1/4), (2/3), (3/7), (4/5), (5/6), (6/1).

4-Complete the following sentences with appropriate words:

- (1) 9 cm/3 cm (2) m/s / km/h (3) Newton.
 (4) Perpendicular to / At rest. (5) Zero. (6) 200 N
 (7) Potential energy / Kinetic energy. (8) Joule / Work.
 (9) Weight of the object / Height / Joule.
 (10) Its weight / Height above the ground surface.
 (11) Kilogram / Newton. (12) Potential / Kinetic.

5-Place a (✓) or (X) and, correct the wrong:

- (1)(X) the distance. (2) (X) in m/s when
 (3) ... (X) Is 80 km/h (4) (✓) (5). (X) is in the same direction of motion.
 (6) . (X) equals 30 J (7), (✓) (8) (✓)

6-State the mathematical relationship between

- (1) $v = d$ (2) $W = F \times s$ (3) $PE = w \times h$
 (4) $w = m \times g$ (5) $PE = m \times g \times h$

Give reason for each the following:

- (1) Because distance is the total length of the path taken by the object while moving from the starting point to the end point, while displacement is the shortest straight path connecting between the starting point and the end point in a constant direction.
 (2) Because the displacement is equal to zero.

- (3) Because the direction of the force applied is in the same direction of the motion
- (4) Because the chemical energy found in food and fuel is potential energy stored in chemical bonds, it is released and converted into kinetic energy when a chemical reaction occurs

8-What is meant by:

1-- length of any path taken by this object while moving from the starting point to the end point equals 20 m

2-This means that the length of the shortest straight path connecting between the starting point and the end point in a constant direction equals 60 m

(3) The magnitude of the displacement caused by this object is 5 m

(4) The speed of this object is 2 m/s

(5) $v=d/t=20/2=10\text{km/h}$

This means that the speed of this car equals 10 km/h

(6) This means that the energy stored in the object as a result of the work done on it is 20 J

(7) The potential energy of the object is 100 J

(8) $w=PE/h=80/10=8\text{N}$ h 10

This means that the weight of the object equals 8 N

9. When does each of the following occur:

(1) When the object moves in one direction in a straight line.

(2) When the object covers the distance in a time equals 1 s

10. What happen in the following cases:

1-This results in increase the road accidents.

2-The speed of the moving object doubles.

3-The object moves a certain displacement in the same direction of the force which acts on it.

4-The work done remains constant (unchanged).

11. Identify the word or phrase that does not fit in, then state what links the remaining words or phrases

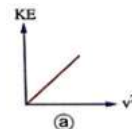
	<u>The odd word</u>	<u>The relation between the rest</u>
1	Mass	Speed= Distance /Time
2	Kinetic energy	Work = Force X Displacement
3	Square of the speed	Potential Energy = Weight of the object X Height
4	Speed	Physical quantities that have the same measuring unit.
5	Force	Measuring units.

Lesson two1. Write the scientific term

- (1) Kinetic energy. (2) Kinetic energy (3) Kinetic energy
(4) Mechanical energy (5) Kinetic energy of water (6) Demolition ball.

2. Choose the correct answer from the given options:

- (1) (A) Speed of the object (2) (B) The object's mass and gravitational field strength.
(3) (D) An object resting on a table (4) (D) $\frac{1}{2}mv^2$ (5) (C) 100 J
(6) (C) $kg \times (m/s^2)$ (7) (B) Decreases to quarter (8) (a)
(9) -1- (A) Potential Energy -2- (C) Kinetic Energy
(10) (B) The kinetic energy of the ball at position (Y) is greater than at position (W).
(11) (D) The potential energy has the highest value at the moment of its fall.



- | | | | | |
|------|---|-----------|-----------|------------------|
| (12) | b | Decreases | Increases | Remains the same |
|------|---|-----------|-----------|------------------|

- (13) B) Kinetic Energy (14) (D) Potential Energy + Kinetic energy
(15) (D) The mechanical energy of an object at the moment it reaches the Earth surface.
(16) (D) Constant at any position.

3. Complete the following statements with appropriate words:

- (1) Potential / Kinetic (2) Its mass/Its speed.
(3) $kg/m/s$ (4) Potential / Kinetic (5) Decreases / Increases.
(6) Potential / Kinetic.
(7) 1-Demolition ball / Demolishing old buildings 2-Potential / Kinetic

4. Put a (✓) or (X) with correction:

- (1) (X) is joule (2) . (x) and an increase in its speed.
(3) (✓) (4) (x) is increased to four times its value when
(5) (✓) (6) (x) Is the greatest when (7) (✓)
(8) (x) into kinetic energy

5-What do we mean by:

- (1) the energy acquired by this object as a result of its motion equals 100 J
(2) The object is at rest (its speed is zero).
(3) This means that the sum of the potential and the kinetic energies of this object throughout its motion equals 500

6-State the mathematical relation between

- (1) $KE = \frac{1}{2} \times m \times v^2$.(2) $KE = \frac{1}{2} \times m \times v^2$ 3) $ME = KE + PE$

7-Give reason for the following:

- (1) Because the mass of the Truck is greater than the mass of a car and as the kinetic energy increases is mass increase
(2) Because when the mass of the car increases its kinetic energy increases and thus the work required to move it increases.
(3) Due to the increase in its speed during its falling, and as the kinetic energy of the object increases, its speed increases.
(4) Because is speed is at its maximum

(5) Because the mechanical energy of the object equals the sum of the potential and the kinetic energies, and at the maximum height of the object the kinetic energy equals zero

(6) Because the decrease in the potential energy of the object during its fall equals the increase in its kinetic energy.

(7) Because mechanical energy equals the summation of the potential and the kinetic energies.

(8) Because the potential energy of the water held behind the dam is converted into kinetic energy that drives the turbines that generate electricity.

(9) Because the potential energy stored in the heavy ball which is suspended at a height is converted into kinetic energy when it is released, which is used in demolition.

8-What happens in the following

(1) The kinetic energy of the object decreases to half.

(2) The kinetic energy of the object increases to four times its value

(3) The pendulum ball moves left and right around the original position, such that its speed decreases as it moves away from the original position, and its speed is at its maximum while passing through the original position.

(4) Its kinetic energy becomes zero and its potential energy is at its maximum.

(5) Its kinetic energy is at its maximum and its potential energy becomes zero

(6) The potential energy decreases gradually and the kinetic energy increases by the same amount.

Unit (3)

Lesson one1. Write the scientific term

- (1) The ecosystem. (2) Species. (3) Biological community.
 (4) Biotic population. (5) Predation. (6) Competition. (7) Mutualism.
 (8) Commensalism (9) Commensalism. (10) Producers.
 (11) Herbivorous organisms (Herbivores). (12) Omnivores.
 (13) Scavengers. (14) Decomposers. (15) Food chain. (16) Trophic level.
 (17) Biological control. (18) Food web. (19) Energy pyramid.

2-Choose the correct answer from the given answers

(1) b. An ecosystem is the interaction of a living community with its surrounding environment.

(2) d. A lively community (3) c. a biotic population (4) d. Competition

(5) c. Nile crocodile and plover (6) b.. Compete for food

(7) a. Commensalism (8) c. The fish (9) c. consumers

(10) d. The hedgehog and the bear (11) a. Omnivorous (12) b. Fungi

(13) b. Recycle nutrients to the ecosystem (14) c. The sun

(15) b. Sun -- Grass -- Cow -- Human (16) a. Path of energy flow.

(17) b. Decomposers (18) b. Plant - locust - bacteria

(19) c. The Living (3) is a carnivore

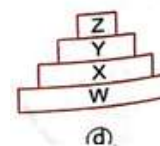
(20) b. The hawk is a consumer and the insect is a predator.

(21) 1- d. Grass - Cockroaches – Rat – Hawk (2) c. Frog.

(22) -1 b. Increase in snake numbers (2) c. 4

(23) c. frogs snakes (24) c. Omnivores (25) a. producer (26) d.

(27) c. The Sun (28) c. 90 % (29) c. 10 .

3- Complete the following sentences with the appropriate word:

- (1) Biological communities / Individuals. (2) Predation / Predator / Prey.
 (3) Mutualism / Predation. (4) Pollen grains / Floral reproduction.
 (5) 1- Commensalism. 2- The bird / The commensal. 3- The gazelle / The host.
 (6) Autotrophic / Heterotrophic. (7) Incisors / Sharp canines.
 (8) Decomposers / The horse. (or any other correct answer).
 (9) Producer/Grasses / Decomposer. (10) The sun / Consumers (herbivores).

4- correct the underline

- (1) The prey. (2) Competition. (3) The host. (4) Photosynthesis.
 (5) Scavengers. (6) Decomposers. (7) Decomposers. (8) Energy.

5-Put (✓) and (x), and correct the wrong:

- (1) (x) The ecosystem (2) (x) lion and zebra
 (3) (x) Both bees and plant flowers benefit from.... (4) (x) Only the commensal
 (5) (x) The plant (6) (✓) (7) (✓) (8) (x) The food web food chains.
 (9). (x) from the producers to the consumers... (10) (✓)
 (11) (x) 10% of energy.

6-Give one example for each of the following:

- (1) Predation The lion and the zebra.
- (2) Competition two lions In order to get food zebra)
- (3) Mutualism. bees and plant flowers
- (4) Commensalism. crocodile and plover
- (5) Producer green plant or algae
- (6) Consumer. rabbit –lion
- (7) Herbivorous . rabbit_zebra
- (8) Carnivorous . Lion - snake
- (9) omnivorous bear - raven- mouse - hedgehog
- (10) Scavengers Hyenas Eagles Cockroaches
- (11) Decomposers Bacteria - Fungi
- (12) Biological control. ladybugs *to feed on aphids*

7-Determine the type of relationship between each two of the following organisms:

- (1) The lion and the zebra. Predation
- (2) Tiger chameleon. Predation
- (3) Dionaea plant and insect. Predation
- (4) The plover and the crocodile Commensalism
- (5) Bees and plant flowers. Mutualism
- (6) Ladybug and aphid Biological control

8-Give reasons for the following:

- (1) Because in this nutritional relationship one of them (the lion) benefits, while the other is harmed or loses its life (the zebra).
- (2) Because the Egyptian plover bird benefits by feeding on the leftover food that get trapped between the crocodile's teeth, while the crocodile neither benefits nor is harmed.
- (3) Because producers can make their own food through the photosynthesis process. while consumers depend directly or indirectly on producers to obtain their food.
- (4) Because the horse is a herbivore that uses its incisors to cut plants, while the lion is a carnivore that uses its sharp canines to tear the prey.
- (5) Because both feed on plants and animals (meat).
- (6) Because they decompose (break down) the organic substances found in the dead bodies of other organisms into simpler substances that mix with the soil and become part of its components.
- (7) Because they decompose (break down) the organic substances found in the dead bodies of other organisms into simpler substances that mix with the soil and become part of its components.
- (8) Because they obtain their energy directly from the sun and can make their own food through photosynthesis process.

- (9) Because it is used in designing food systems that utilise living organisms to eliminate agricultural pests instead of using pesticides.
- (10) Due to their feeding on aphids insects, which are considered one of the agricultural pests that harm vegetables and fruits.
- (11) Because each single organism can feed on multiple sources while this organism itself is a food source for several other organisms at higher trophic levels.
- (11) Because only ($1/10$) of energy is transferred from the living organisms at any trophic level to the living organisms which occupy the next trophic level in the energy pyramid.

Lesson two1. Write the scientific term

- (1) Genetic traits (2) Acquired traits (3) Instinctive behaviours (instinct)
 (4) Reproduction (5) Chromosomes (6) Centromere (7) Genes.
 (8) Nucleotide (9) Genetics (10) One gene one enzyme hypothesis.
 (11) Mutation. (12) Spontaneous mutations (13) Induced mutations.
 (14) Harmful mutations (15) Beneficial mutations.

2. Choose the correct answer:

- (1) b. Curly hair (2) d. an instinctive behavior (3) b. A dolphin playing with a ball
 (4) a. 20 (5) (d) The centromere (6) b. proteins

(7)	(d)	Chromatids	Centromere	DNA
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- (8) d) proteins (9) 1. d. nucleotides

2- b. Responsible for the appearance of a hereditary trait of the living organism.

- (10) d) DNA (11) c. Beadle and Tatum (12) (b) enzymes

- (13) b. (B) (14) a. production of wheat plants resistant to wheat rust disease

3-Complete the following statements:

- (2) Genetic / Acquired. (1) Genetic / Acquired
 (3) A bat sleeping upside down / A chicken laying on eggs. (or any correct answer)
 (4) The cytoplasm / The nuclei.
 (5) -1 The chromosome. 2- Chromatid / Centromere
 (6) 46/32 (7) DNA/Histone (8) Gene / Nucleotides.
 (9) Genetic factors / Genes (10) Beadle/ Tatum.
 (11) Enzyme / Chemical reaction / Protein. (12) Spontaneous / Induced.
 (13) The severe muscular dystrophy / The change in skin colour.

4-com Produce Howin Responsibl is:5-Correct the underlined words:

- (Nuclei (3) Gregor Mendel (4) Enzyme.
 (5) The severe muscular dystrophy (6) An agricultural technique.

6-Mark(✓) or (X) for each statement, with correction:

- (1) (X) is a genetic trait (2) (X) without learning and training.
 (3) (X) have the same number (4) (X) Genes....
 (5) (✓) (6) (✓) (7) (✓) (9) (X) of induced mutations.
 (10) (X) a beneficial spontaneous mutation (11) (X) butter by olive oil.

7-Give one example for each of the following

<u>Trait</u>	<u>Example</u>	<u>Trait</u>	<u>Example</u>
<u>1-General trait</u>	The eye colour. Facial freckles	<u>(2) Acquired trait</u>	A child learning to walk. Learning languages. Reading and writing.
<u>3) Instinctive behavior</u>	Chicken laying on eggs. A squirrel breaking hazelnut shell.	<u>(4) Spontaneous</u>	A dark-skinned mother giving birth to an albino child (albino mutation)
<u>(5) Induced mutation</u>	Production of featherless chickens	<u>6) Beneficial mutation</u>	
<u>(7) Harmful mutation</u>	* Among harmful mutations: spinal deformity (curved spine). . Among lethal mutations: The severe muscular dystrophy (wasting and weakness of muscles) in certain newborns.	<u>(8) Lethal mutation</u>	* Among beneficial spontaneous mutations: The change in the skin colour to adapt to the environment. * Among beneficial induced mutations: - Production of seedless fruits. Production of wheat plants resistant to wheat rust disease.

8-Give reasons of each of the following

- (1) Because the trait of eye colour is transmitted from parents to offspring without learning and is inherited from one generation to the next, while the trait of child's ability to walk is acquired by the child from the surrounding environment through learning or training and not inherited from parents.
- (2) Because they are behaviours and skills that are transmitted from parents to offspring without learning.
- (3) Because it exists in the form of two strands twisted around each other, forming a double helix.
- (4) Because it is composed of small segments called genes, which are responsible for the appearance of the hereditary traits in the living organism.
- (5) Because he concluded from his experiments that each hereditary trait is controlled by a pair of genetic factors, which were later known as genes, and without his efforts, scientific research today would not have achieved such remarkable advancements in the field of genetic engineering.
- (6) Because each gene produces a specific enzyme which is responsible for the occurrence of a chemical reaction that leads to the formation of a protein that expresses a specific hereditary trait.

- (7) Because each enzyme is responsible for the occurrence of a chemical reaction that leads to the formation of a protein that expresses a specific hereditary trait.
- (8) Due to the difference of genes present on a single chromosome, which leads to the difference of the hereditary trait that each gene is responsible for expressing.
- (9) Because it occurs naturally without human intervention.
- (10) Because it represents an induced mutation as it occurs through human intervention and beneficial because it reduces the electrical energy used in air conditioning in farms in hot regions.
- (11) It is a spontaneous mutation because it occurs naturally without human intervention, and it is a beneficial mutation because it helps these individuals to absorb vitamin (D) better.
- (12) Because it results from placing the watermelon in a square moulds during its growth, causing it to take the shape of the mould without any change in its genetic nature.
- (13) Because it converts lactose sugar found in milk and dairy products, such as cheese and yogurt, into simpler sugars that are easier for the body to absorb.

9-What are the results of each of the following

- (1) The formation of a specific enzyme by a gene
- (2) Variation in the arrangement of nucleotides on DNA
- (3) Change in the nature of a specific gene
- (4) Severe muscular dystrophy in some newborn infants
- (5) Placing the watermelons in a square moulds during its growth
- (6) A person suffering from lactose intolerance eats a piece of milk chocolate

Unit (4)

Lesson one

1. Write the scientific term

- (1) Evaporation (2) Condensation (3) Melting.
 (4) Freezing (5) Water cycle (6) Transpiration.
 (7) Precipitation (8) Surface runoff (9) Desalination of seawater.

2. Choose the correct answer from the given answers:

- (1) b) 71% (2) a.  (3) (c) Evaporation

(4) (c) The volume of water in the two beakers (B) and (A) changes.

(5) (d) Water vapor in the air

(6)	(c)	Melting	Evaporation	Condensation	Freezing
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(7) (d) Transpiration (8) (b) Evaporation (9) (b) Clouds

(10) (b) Infiltration and surface runoff

(11) 1. (b) (W): Condensation; (X): heat loss 2. (b) (W) and (Z) only

(12) (a) Weathering

3. Choose from column (B) what matches column (A).

(1/1), (2/2), (3/5), (4/3), (5/4)

4. Complete the following sentences with what is appropriate:

- (1) Agriculture / Industry / The temperature (2) Gaseous / Liquid / Solid.
 (3) Losing / Gaining (4) Evaporation / Condensation / Boiling.
 (5) Evaporation of water from large water bodies / Evaporation of sweat secreted by human and animals (6) Ice crystals / Hail.
 (7) Earth's gravity / Groundwater (8) Heat of the sun / Earth's gravity.
 (9) Desalination of seawater.

(5) Complete the following diagram:

- (1) Melting (2) Evaporation (3) Condensation (4) Freezing.

(6) Correct the following underlined words:

- (1) 29% (2) Condensation (3) Freezing (4) Condensation.
 (5) Heat of the sun (6) Evaporation.

(7) Mark a (✓) and (x) with the correction:

- (1) (x) . about 70% 2- (x) freezing process 3- (✓)
 4- (x) it gains 5- (✓) 6- (x) through evaporation process
 7- (x) is less than 8- (x) the effect of Earth's gravity 9- (✓)

8. Give reasons for the following:

- (1) Because it is used in various fields such as Drinking, agriculture, industry and sanitation, and it plays a vital role in regulating the temperature of the Earth planet
 2- To ensure sustainability in the world fresh water represents approximately 3% only of the water available on the Earth's surface
 3- Because each substance has its own property of boiling at a certain temperature

4-Due to the condensation of water vapour present in air forming the water droplets on the outer surface of the cold cup

5-Because the heat of the sun causes water to move from the Earth to the atmospheric air through the process of evaporation, while the gravity of the

6-To face the shortage of fresh water resources suitable for drinking and irrigation

9-What is meant by each of the following?

(1) Evaporation. (2) Condensation. (3) Water cycle. (4) Transpiration.

(5) Precipitation. (6) Surface runoff. (7) Desalination of sea water.

10-State the importance or use of each of the following:

(1) Water.

(2) It causes water to move from the Earth to the atmospheric air through the evaporation process

3-It moves clouds, causing tiny water droplets to accumulate together, forming larger and heavier water drops

4-It causes the water to return back to the Earth again through the precipitation process

Lesson two**1. Write the scientific term**

- 1-Rocks 2- Weathering 3- Mechanical weathering
4-Chemical weathering 5-Spherical weathering 6- Erosion
7-Sediments 8-Sedimentary rocks 9- Lithification
10-Metamorphic rocks 11- Magma 12- Lava 13-Igneous rocks
14-Plutonic igneous rocks 15-Surface igneous rocks
16-Rock cycle 17-Fossil fuels